Cotton Field Day

UC Shafter Research and Extension Center

Tuesday , September 21, 1999

Sponsored by:

- *University of California, Cooperative Extension*
  and
- *Western Integrated Cropping Systems Research Unit USDA Agricultural Research Service*

For more information, contact Dr. Bob Hutmacher at the address below.

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"Serving the San Joaquin Valley since 1922"

WELCOME

to the

UNIVERSITY OF CALIFORNIA
SHAFTER RESEARCH & EXTENSION CENTER

Cooperating Institutions:
- United States Department of Agriculture, Agricultural Research Service, Western Integrated Cropping Systems Research Unit
- University of California Cooperative Extension
- University of California, Division of Agriculture & Natural Resources

The information contained in this booklet was assembled for distribution at the 1999 Cotton Field Day (September 21) at the Shafter Research & Extension Center. The following items are included for your information:

- Summaries of approved 1999 Research Projects, including those featured at the Cotton Field Day. The phone numbers, addresses, and e-mail addresses of the researchers are included where available, should you require more information.
- List of all approved Research Projects for 1999 at the Shafter Research & Extension Center, plus the names and phone numbers of the Project Leaders.
- Maps of the field station showing 1999 project locations for both the Main Station and the "South 40".
- A listing of the current members of the Shafter Research & Extension Center Research Advisory Committee (RAC), which meets several times per year to discuss station operation, allocation of resources, facility needs, and research priorities. Comments regarding station research activities can be directed to this committee.

ACKNOWLEDGEMENTS
The helpful assistance of the University of California and USDA-ARS staff of the Shafter Research & Extension Center is gratefully acknowledged for all their work in running the projects you see both at this station and at off-station locations, and for help in putting on this Field Day. Thanks to Dr. Vern Elliott of the USDA-ARS at Shafter for his work on the cover of this booklet. Special thanks to the staff at CA Planting Cotton Seed Distributors (CPCSD) for use of the tour trailers and public address equipment during field day. Lastly, we are appreciative of the support from seed and chemical companies who provide the lunch and refreshments at Field Day.

We are also very grateful for the continued financial support of the many cooperators in the Cotton Industry who contribute to the facilities and research support at the Shafter REC, including:

- CA Crop Improvement Association
- University of California, Davis – Agronomy and Range Science Department
- County of Kern Government Agencies
- Kern County Agricultural Commissioner's Office
- University of California, Davis – Entomology Department
- Grower/Cooperators
- PCA's, Advisors & Consultants
- Cotton Incorporated
- CA Department of Food & Agriculture
- Cotton Pest Control Board
- San Joaquin Valley Cotton Board
- CA Cotton Growers & Ginners Associations
- United States Department of Agriculture – Agricultural Research Service
- Cotton industry chemical suppliers and support staff
- Representatives of cotton seed companies

We welcome you to the Shafter Research & Extension Center and thank you for attending the Cotton Field Day. If we can provide you with additional information about on-going projects or activities here at the Research Center, please feel free to contact us.

Bob Hutmacher
Brian Marsh
Lyle Carter

Bob Hutmacher
Extension Agronomist
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Brian Marsh
UCCE Farm Advisor
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USDA-ARS, Shafter

Shafter Cotton Research Field Day

Sponsored by: University of California and USDA-ARS Western Integrated Cropping Systems Research Unit

Tuesday, September 21, 1999

University of California Shafter Research and Extension Center
17053 N. Shafter Avenue, Shafter, CA
(1 1/2 miles north of Highway 43 on Shafter Avenue)

Sign-up and Refreshments	**9:00 AM**
Field Tours, Displays	**9:30 AM - noon**
Industry-Sponsored Lunch *(no reservations required)*	**noon**

AGENDA

Topics and Speakers will include:

- Approved Acala and Pima Variety Evaluations
  Dick Bassett, Cotton Agronomy Specialist, UC Shafter REC
- Cotton Arthropod Pest Research - Management Influences on Pest Populations
  Larry Godfrey, Extension Entomologist, UC Davis
  Jorge Cisneros, Postgraduate Researcher, UC Davis
- Detection of Spider Mite Damage in Cotton Using Multispectral Remote Sensing
  Steven Maas, Research Plant Physiologist, USDA-ARS, Shafter
  Glenn Fitzgerald, Research Plant Physiologist, USDA-ARS, Shafter
- UCCE / Farm Advisor Variety Trials (CA Upland, Acala, Pima) for 1999
  Bob Hutmacher, Extension Agronomy Specialist, UC Shafter REC
- An Update on Bioremediation Efforts for Sticky Cotton
  Vern Elliott, Research Plant Pathologist, USDA-ARS, Shafter
- Nematode Management in Crop Rotations
  Pete Goodell, Regional IPM Specialist, UCCE Kearney Agric. Ctr., Parlier
- Alternative Tillage Systems Research and Economics
  Lyle Carter, Research Leader / Agricultural Engineer, USDA-ARS, Shafter
- Biological Control Options and Introduced Natural Enemies of Cotton Aphid
  Kris Godfrey, Research Entomologist, CA Dept. Food & Agric., Sacramento

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2 hours PCA credit requested

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TABLE OF CONTENTS
SUMMARIES OF APPROVED RESEARCH PROJECTS
(located in the green pages of this booklet)

AGRICULTURAL REMOTE SENSING STUDIES - 1999

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Remote sensing can be a valuable tool to assess field spatial variability and if flown on a regular schedule can also show patterns in crop development during the season. Various wavelengths of light are important in the detection of crop parameters, including visible, near infrared, and thermal. Image processing and computer enhancement can display areas within a field that relate to certain growing conditions before they would become obvious to an observer on the ground.

During 1998-1999 the Shafter remote sensing group investigated: 1) Early detection of mites in cotton, 2) water stress in cotton, and 3) correlations of mid-season remotely sensed images to final yield. This is the second year that these studies have been conducted allowing researchers to understand year to year variation in the measured parameters and validate agronomic models.

The Shafter Airborne Multispectral Remote Sensing System (SAMRSS) was flown in a light aircraft over 30 times in 1999 to characterize cotton dynamics in research plots and cooperating growers fields. The three digital cameras have special filters that allow specific narrow wavelengths of light into the camera. These bands, in the red, green, and near infrared, were complemented by the addition of a thermal infrared camera. This camera is especially suited to recording canopy temperature which is indicative of water stress and will add greatly to the on-going research into early water stress detection by remote sensing. The addition of this fourth frequency band should allow even better detection of mite damage since early infestations could change the water characteristics of leaves leading to variations in leaf surface temperature.

A computer-based imaging processing technique was developed that successfully allowed detection of mite infestations and distinguished them from water stressed canopy. Additionally, it was found that mid-season images had the highest correlations to final yield and that this corresponded to boll initiation, a time when the maximum amount of canopy would be available for boll production which relates to final yield.

<u>Plans for the future include</u>:

1) Development of a mite spectral "signature" that will allow detection of mites in any field from remotely sensed imagery.
2) Continued development of a water stress model allowing estimation of water stress from remotely sensed images.
3) Continued project funding by Cotton Incorporated allowing mid-season estimation of final yield through the use of a yield monitor and remotely sensed imagery.
4) The second year of a project funded by NASA to acquire hyperspectral imagery of fields for early mite detection.

ANNUAL MORNINGGLORY CONTROL WITH BXN COTTON

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BXN (Buctril) transgenic tolerant cotton has been tested on a limited basis in University trials in 1997 and 1998 with extensive testing in 1999. In 1999, due to the changes in "One Quality Law" governed by the SJV Cotton Board, several thousand acres of Stoneville BXN-47 cotton are now being commercially grown. Results of University trials, as well as grower experience, has indicated excellent control of most summer annual broadleaf weeds when Buctril is applied over-the top of 2 to 4 leaf cotton to weeds no larger than the 4 to 6 leaf stage. Tank mixes of Buctril and MSMA have enhanced annual morningglory control but when tank mixed with grass herbicides (Fusliade, Poast, and Prism) control of pigweed is considerably reduced. Buctril has no grass activity, so tank mixes with the selective grass herbicides are necessary to achieve grass control. There appears to be no loss of grass activity when mixed with grass herbicides. Buctril can be applied over-the-top and/or post directed up to 75 days from harvest without effect to cotton growth and development.

The objectives of the University studies have been to evaluate weed control efficacy, cotton tolerance and develop and integrate herbicide tolerant cottons into our production system. Alternative production systems such as conservation tillage and ultra narrow row cotton using herbicide tolerant cottons (BXN and Roundup Ready) are being studied to determine their economic and agronomic feasibility.

The objective of the current study at the Shafter Research and Extension Center is to evaluate the control of annual morningglory with Buctril alone and in tank mixes with MSMA and Staple. Stoneville BXN-47 was planted in mid April in a field uniformly and heavily infested with annual morningglory. The field was divided into four 40 inch rows by 150 feet and replicated three times in a randomized complete block design. Treatments were applied on May 24, 1999 over-the top of cotyledon to one true leaf cotton when the morningglory was in the 4 to 6 leaf stage with 4 to 12 inch runners. Herbicides were applied with a tractor mounted sprayer delivering 22 gallons of spray solution per acre with 8002 nozzles at 30PSI. Seven days after the initial treatments, which resulted in extremely poor control, the morningglory was removed by hand, and the field was then cultivated and irrigated. Treatments were then reapplied on June 22 over-the-top of 11 to 12 leaf cotton when the morningglory seedlings were cotyledon to 3 leaves. A third treatment of Buctril at 1 lb.ai/A was applied to the entire study area as a post directed application on July 8th. All treatments at all application dates received Agridex at 1% v/v.

Evaluations at 7 days after treatment (DAT) indicated 93 to 100% control of morningglory in the cotyledon to 1 leaf stage. Both Buctril and Staple tank mixed with MSMA were providing 100% control. Control of morningglory in the 2 leaf or greater stage was reduced by as much as 75%. At 16 DAT best overall control was being exhibited by the Buctril, MSMA tank mix at 95%. Buctril alone was providing 80 to 83%, while Staple alone was providing 63% control. Evaluations will again be made at defoliation and lint yield and quality data will be collected.

BIOREMEDIATION EFFORTS FOR STICKY COTTON

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Sticky cotton, the contamination of cotton lint by insect honeydew, is a serious problem that makes it difficult for the textile industry to process the cotton fiber. This stickiness reduces the price paid to the grower and damages the quality reputation of entire production areas. Although insect management is playing the major role in reducing or preventing sticky cotton, remedial measures to reduce the stickiness of contaminated lint are still needed. Bioremediation, the use of microorganisms to degrade the contaminating sugars, may offer an economical and effective way to reduce the stickiness of lint.

Objectives of the current USDA ARS project are to examine the ability of different strains of yeast to utilize the sugars in insect honeydew, to select strains suited for bioremediation, and to develop methods to monitor and control microbial activity as sugars are broken down.

Research has evaluated the ability of different yeast strains to grow on various sugars including honeydew sugars (Figure1). Further work is being done to identify which sugars are being metabolized and to select strains which can rapidly breakdown the sugars on seed cotton.

ARS research has also developed a CO_2 flux measuring system to monitor microbial respiration on sugar contaminated lint. The system consists of an infrared gas analyzer, a flow controller, and a sample chamber. Tests showed that CO_2 evolution can be detected from small samples of artificially contaminated lint inoculated with a strain of yeast (Figure 2). Continuing efforts are underway to develop additional equipment to measure cotton CO_2 flux in cotton samples up to field module size. This CO_2 flux system provides a rapid, sensitive, and scalable method of monitoring microbial degradation of sugars on cotton lint and will be used to identify the physical and biological parameters necessary for bioremediation of sticky cotton. It might also find use in on farm monitoring of cotton modules during bioremediation and subsequent storage before ginning.

In the future, bioremediation may offer a way to clean up sticky cotton. This technology would offer a rescue treatment for situations when insect controls fail and aphid or whitefly populations result in lint contamination. Bioremediation technology would not only offer options for individual producers but would also serve to protect the quality reputation of the entire production area.

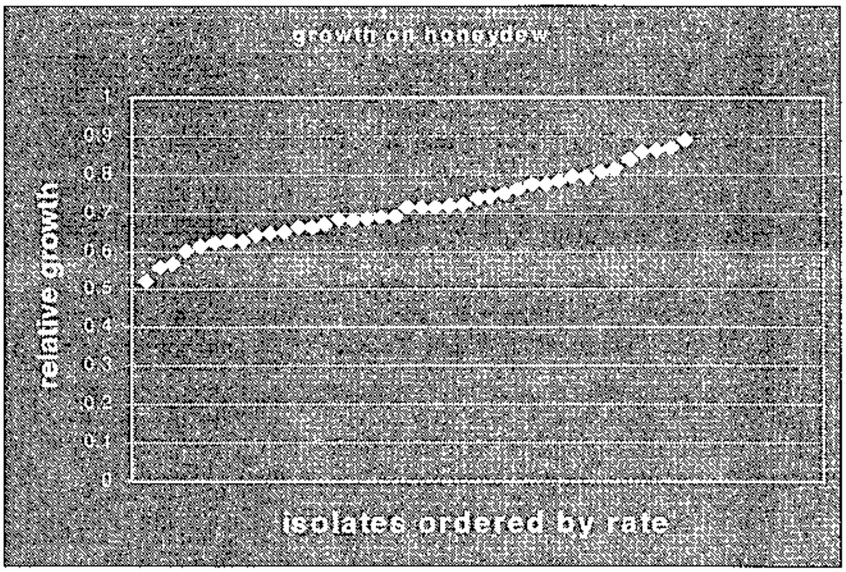

Figure 1. Different strains of yeast collected from cotton and other plants were tested for the ability to grow on insect honeydew. A comparison of the relative growth rate shows that most of the yeast were able to grow on some of the sugars in honeydew and that a considerable range of rates occurred. The more rapidly growing stains will be tested for their effectiveness in reducing the stickiness of cotton.

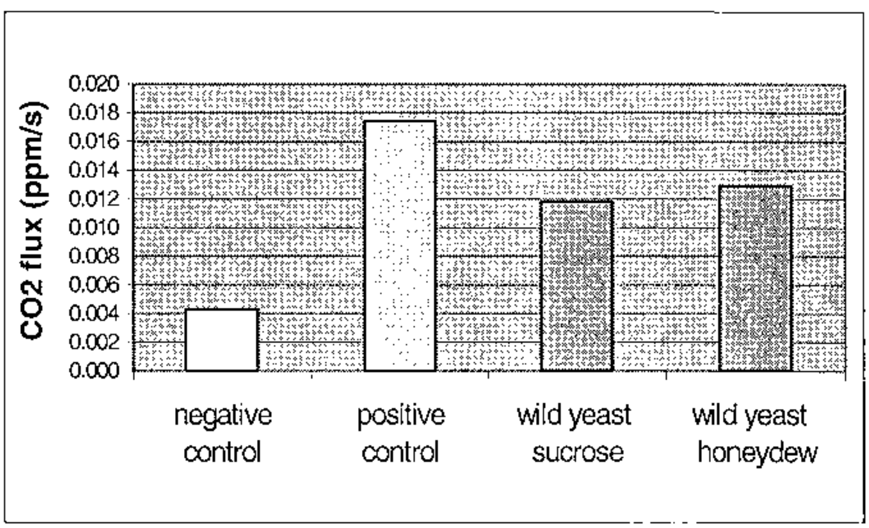

Figure 2. CO2 flux can served as an indicator of microbial degradation of sugar on cotton lint. CO2 production by wild yeast on sucrose or whitefly honeydew was significant and almost as great as a positive control of bakers yeast on sucrose.

CA UPLAND VARIETY TRIALS - LARGE-SCALE AND SCREENING

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1999 Studies

In 1999, studies are underway at nine locations in the San Joaquin Valley in tests run by our office in cooperation with the six San Joaquin Valley UCCE cotton Farm Advisors. At the time of writing this report, we have limited data to report, since no final plant mapping data have been analyzed and we are still a way off from defoliation and harvest. Instead, the following will be a brief description of the type of testing program initiated for 1999, and data collection plans.

Two different types of studies are underway this year, (a) a large-scale plot study on grower fields to evaluate varieties in large plots, where adequate seed is available; and (b) a smaller-scale screening trial to evaluate varieties where less is known of expected performance, or where limited seed is available (making them more suitable for small-plot studies.

Large-Scale Trials

We have a six-location study that for 1999 involves twenty-one varieties planted at six grower fields (one in each of the six cotton-growing counties of the San Joaquin Valley). These are large-scale tests, with three or four replications of four to eight row plots that range from about 600 to over 2600 feet in length, depending upon the site. Final yield data will be collected, along with samples to determine HVI quality characteristics. Late-season field data will be collected to evaluate the presence of significant *Verticilium* wilt problems in fields, and relative differences in earliness (estimated using NACB measurements) and relative difficulty in defoliation across varieties. The Acala varieties "Maxxa" and "Phytogen 33" were included for comparison purposes in these Upland tests. Varieties included in this test for 1999 are:

Company	Entries
CPCSD	(Maxxa)
Phytogen	(Phytogen-33, PSC-413, GA-161)
AgrEvo	(FiberMax 989, ACSI IF-1000)
AgriPro	(AP-6101, AP-7115)
Stoneville	(BXN-47)
Olvey and Associates	(OA-36)
Buttonwillow Research	(BR-C9801, BR-C9802)
Paymaster	(PM-1560BG)
Delta Pine	(Nucotton 33B, 448-B)
Suregrow	(SG-747, SG-501)
Helena Cotton Research	(HCR-9220, HCR-7114-46)
Germain's Cotton	(GC-400 BG, GC-204)

Screening (Advanced Strains) Trials

These trials are conducted in three field locations, the West Side and Shafter Research and Extension Centers of the University of CA, plus a grower test location in Merced County. Field trials are generally small, with four replications and 50 to 150 foot row lengths in four or six-row trials. Maxxa and Phytogen-33 Acala varieties were also included in these trials for comparison purposes. Data collection will be similar to that in the Large-Scale Upland trials described above. The 28 varieties entered in the Screening Trials are as follows for 1999:

Company	Entries
CPCSD	(Maxxa)
Phytogen	(Phytogen-33, PSC-355, HS-12, PSC-952)
AgrEvo	(ASCI EXPO-223, ACSI-EXPO-052, ACSI-EXPO-781)
AgriPro	(APX-9257, APX-7126, AP-6102)
Olvey and Associates	(OA-77, OA-66)
Buttonwillow Research	(BR-9904, BR-9905, BR-9906)
Paymaster	(PM-1560 BG / RR)
Delta Pine	(Topaz, Pearl)
Suregrow	(SG-105, SG-821)
Helena Cotton Research	(HCR-9240, HCR-9310, HCR-9263)
Germain's Cotton	(GC-9810, GC-9811, GC-9812)
Pure Genetics	(VT-901)

1998 Studies

1998 studies were run by Dr. Dick Bassett and the San Joaquin Valley Cotton Board, with a fairly restricted number of entries. Results from those 1998 studies are available in reports of the San Joaquin Valley Cotton Board, or can be obtained by contacting the office of Dr. Dick Bassett.

COTTON STALK MANAGEMENT

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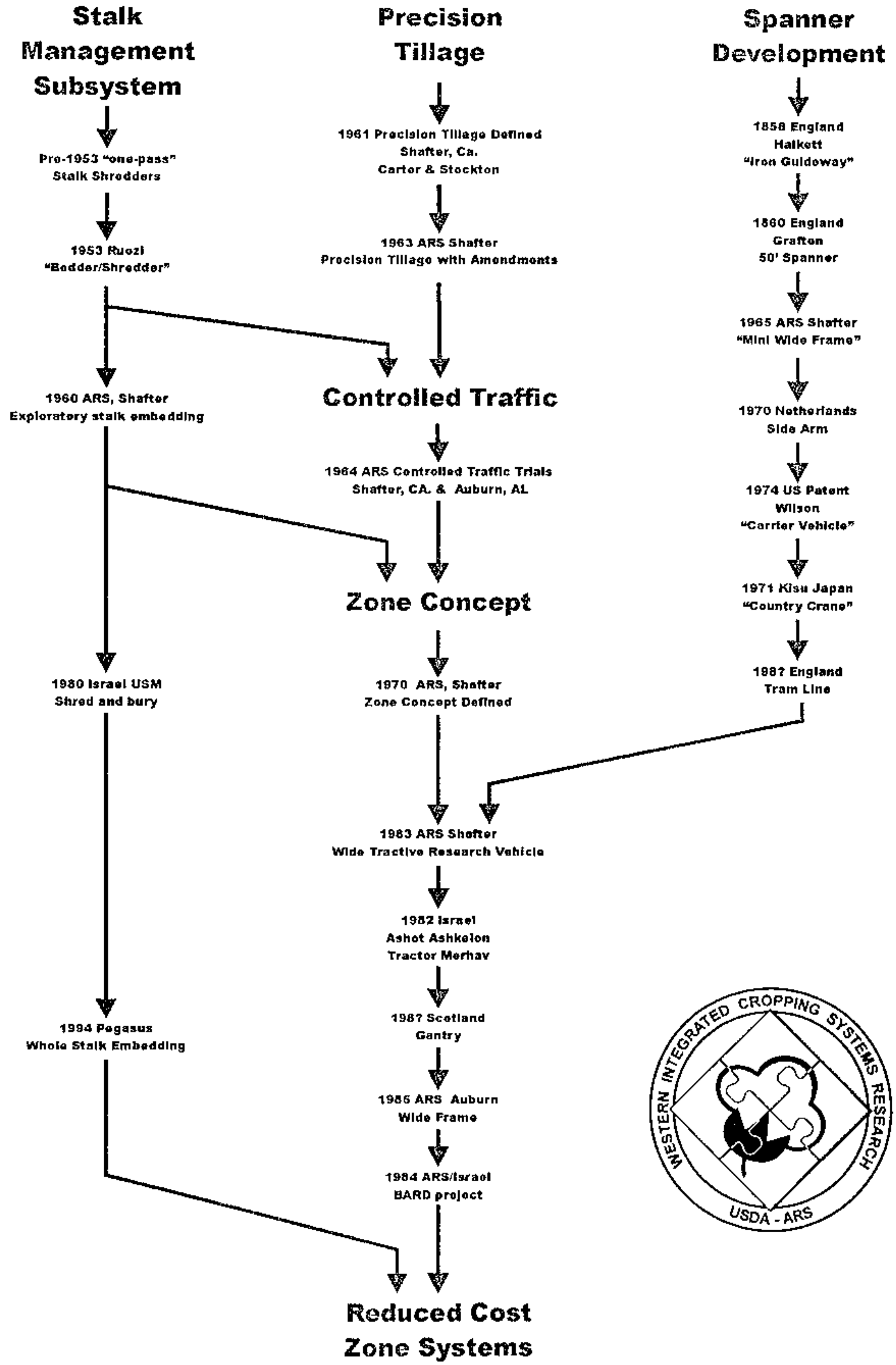
The cotton stalk management study of one-pass stalk embedding as a key component to a reduced tillage system and controlled traffic systems for cotton is in its fourth year of evaluation. The study was extended one extra year to verify yield results obtained in the 1998 crop year. The original hypothesis included reduced energy, improved soil condition, no disease differences, no nutrient differences and no yield differences. Of these hypothesis all are true except for yield differences. In years 1 and 2, no yield difference could be measured between stalk embedding and normal stalk disposal systems. However, in year 3, we measured a substantial yield increase for stalk embedding. Because the yield increase was substantial we have not published these yields for two reasons: 1) there is always the possibility in any test that one years results are not representative, and 2) we have no explanation for the yield increase. If the 1999 season yields substantiate the observations of 1998 then the significance of stalk embedding is greater than the cost savings related to tillage and equipment and the advantages of controlled traffic systems. Also this result, if repeatable, will be an indication that changes in soil environment require several years for a change in production.

The study began as a Cooperative Research and Development Agreement (CRADA) between USDA, ARS and the Pegasus Company of Tucson, Arizona. Pegasus is developing a patent issued to Wayne Coates and Gary Thacker of the University of Arizona for the first workable idea for one-pass whole-stalk embedding. ARS at Shafter spent several years in the 1960's attempting to design such a machine. All were failures for one or more reasons and all shared the same two problems; 1) operation was erratic and 2) the stalks were left standing in the first and last 20 feet of each pass. The patent described unique methods of folding the plant into a trench that we did not imagine in the 60's. Within the CRADA study we have determined that the system will work in certain soil conditions. The potential for cost reduction with a system based upon embedding has been estimated at between $30 and $50 per acre depending upon the system that is compared. Perhaps the most interesting data to date has been the soil strength profiles, showing an increased volume of soil available for root exploration with combination of stalk embedding and precision tillage. The precision tillage was accomplished with bent-leg shanks positioned to reach from the side and not disturb the stalk embedded "ribbon". The most important data, organic matter content and distribution and nitrogen distribution will not be obtained until after harvest.

Because the CRADA study was limited to fields on the Shafter Research and Extension Center, we needed information for other soil types and conditions. Through a 1999 research grant from Cotton Incorporated we were able to work on several fields throughout the cotton area of the San Joaquin Valley. The studies were applied before the initiation of the grant in September through December of 1998. The operation results are mixed. The appearance of some of the fields after embedding was not as uniform as in the Station study. A few ideas for improving performance were identified by project personnel, cooperating machinery companies, and cooperating farmers. Many of these ideas will be incorporated in future tests. However, in all fields that were continued, the cotton growth appeared normal. Yield data is not available. Although no longer supported by Cotton Incorporated after January 1, ARS will continue the study for at least one more year.

On the next page is a chart to help explain the long process, beginning in the 19^{th} century, to develop a zone production system particularly for cotton. The last key is the development of the stalk embedding system that will allow development of practical, low-cost management systems no longer requiring broadcast tillage such as disking and plowing and will allow controlled traffic systems for long term improvement in soil "tilth".

ARS and Production System Development
Shafter, California 1948 - 1999



ECOLOGY OF GENERALIST PREDATORS IN THE COTTON AGROECOSYSTEM

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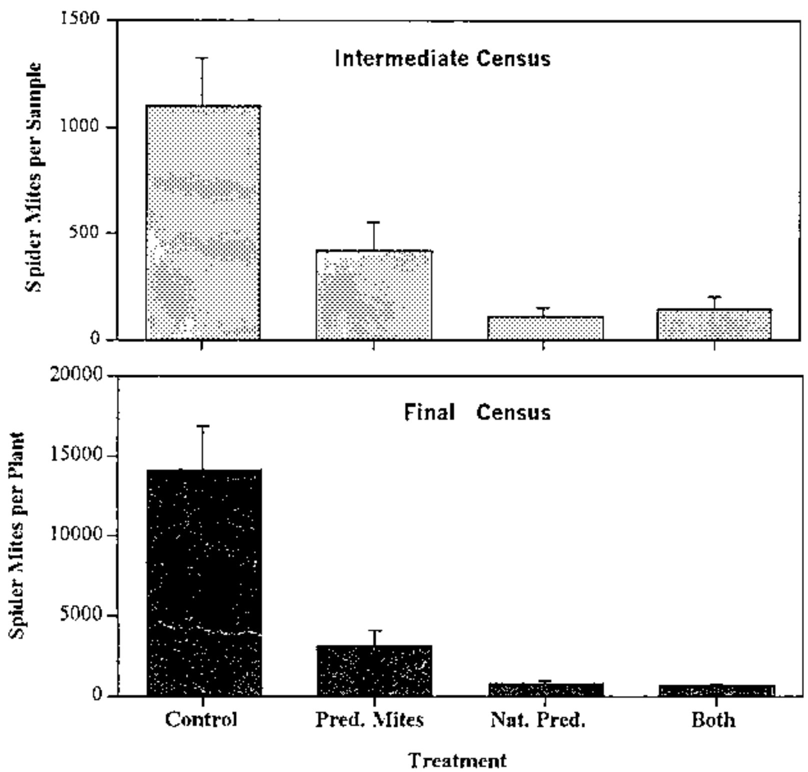
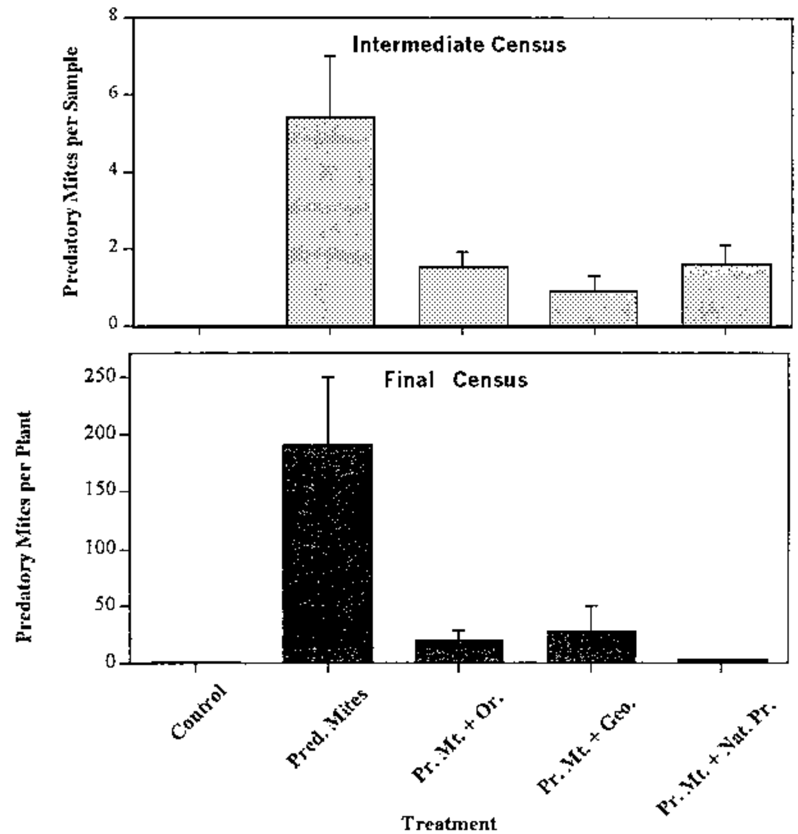
The goals of our research are to examine the role that naturally-occurring predators play in controlling spider mites and determine if predatory mite releases can improve spider mite control. During 1996 & 1997, we performed large-scale releases of the western predatory mite using low release rates and found that releases did not increase predatory mite numbers and did not improve spider mite control. Thus, we have attempted to identify factors that could be limiting predatory mites in hope that we can improve spider mite biological control. During 1998 & 1999, we completed four experiments evaluating: (1) compatibility of predatory mites with naturally-occurring insect predators, (2) influence of host plants on western predatory mites, (3) effect of western flower thrips on spider mite control, and (4) the importance of pollen and nectar for predator survival.

We have identified two factors that probably explain why western predatory mites do not thrive in cotton: predation and host plant effects. Results from field experiments during 1999 through 1997 showed that generalist predators had a large negative effect on the western predatory mite; they prevented predatory mite populations from increasing. However, in the absence of these predators, predatory mite populations grew by more than seven times their initial density and reduced spider mites. Also, we found that western predatory mites were more abundant on soybeans and grapevines than on cotton in a common garden experiment. Thus, western predatory mite releases are unlikely to reduce spider mites in cotton unless high release rates are used and generalist predator abundance is low. Other species of predatory mites that we have found at higher densities in cotton are being further studied. Prelimary results from 1999 indicate that releases of these species effectively reduced spider mites.

Research from 1997, 1998, and 1999, showed that naturally-occurring predators substantially contributed to the control of spider mites. Specifically, we found that the minute pirate bug (*Orius* spp.), the big eyed-bug (*Geocoris* spp.), and the western flower thrips (*Frankliniella occidentalis*) all could reduce spider mite densities. We also found that pollen and nectar availability improved minute pirate bug survival. Therefore, efforts should be made to conserve these predators by using selective pesticides for target pests. Broad spectrum insecticides should be avoided.



Suppression of spider mites by the western predatory mite and the unmanipulated predator community (Nat. Pred.) when present individually and together at the Shafter Research and Extension Center, 1998.



Western predatory mite abundance when alone (Pred. Mites) and in combination with the predators *Orius* (Pr. Mt. + Or.), *Geocoris* (Pr. Mt. + Geo.), and the unmanipulated predator community (Pr. Mt. + Nat. Pr.) at the Shafter Research and Extension Center, 1998.

INTERACTION OF COTTON NITROGEN FERTILITY PRACTICES AND COTTON APHID POPULATION DYNAMICS IN CALIFORNIA COTTON

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Introduction:
During the last 10 years, the cotton aphid (*Aphis gossypii*) has developed from a non-pest to one of the most significant insect pests of California cotton. For instance, in 1997, cotton aphid outbreaks were severe and an estimated 3.5% yield loss occurred despite ~$40/acre control costs which were incurred. Cotton aphid infestations during the mid-season (July to mid-August) reduce cotton lint yields since the aphids act as a significant sink, competing with the bolls, for energy. The late-season infestations (mid-Aug. to Sept.) are problematic because the aphids deposit honeydew on the exposed cotton lint, which reduces the lint value. Reasons for this change in pest status of cotton aphid are unclear; however, one of the most noticeable changes in cotton production over the last 10 years is the use of a plant growth regulator instead of irrigation and nitrogen deficits to limit early-season cotton vegetative growth. This has allowed cotton production practices in the SJV to evolve to higher nitrogen fertilization and irrigation inputs.

Host plant conditions including high nitrogen and adequate moisture are generally optimal for aphid population growth and development. Small plot research by Cisneros and Godfrey in 1997 and 1998 at the Shafter Research and Extension Center verified that there were more cotton aphids on cotton in a 200 lbs. N/A compared with 50 lbs. N/A treatment. The idea of balancing the amount of nitrogen needed for optimal cotton yield with the level required to mitigate cotton aphid population build-up is the goal of this project. Utilizing cultural control measures such as nitrogen management could play an important role in cotton aphid management. Biological control, predators and parasites, of mid- and late-season aphid outbreaks is only moderately effective. Relying on insecticides for aphid control adds undesirable production costs and also promotes the development of insecticide resistance in this aphid pest. Therefore, additional non-chemical control measures would fill an important void.

Project Description:
Two studies were conducted in 1999 at the Shafter Research and Extension Center to further examine the interaction of nitrogen level and aphid populations in cotton. Aphid levels were monitored in plots containing treatments of 0, 50, 100, 150, and 200 lbs. N/A; superimposed across these treatments was the application of either Capture® or Provado® (or untreated). Both high nitrogen and application of Capture have been shown to increase aphid population levels; however, the interaction between these factors has not been evaluated. Treatments were applied in mid-August as the aphid populations began to develop. At the end of August, populations appeared to be increasing, but at that time the season was moving out of the "mid-season" period

for cotton (which was the target for this study) and into the late-season. Cotton aphids can also be a pest during the "late-season" for cotton, but the nitrogen regimes that were set-up have likely largely equilibrated at that time. Data are still being collected and summaries have not yet been prepared.

For the second study, a detailed examination of the mode through which nitrogen influences cotton aphid populations was conducted. Cotton aphids from a laboratory colony were used and infested into cotton plots within mesh bags. Five aphid adults were confined on to a 4th main stem node leaf and allow them to deposit aphid nymphs for 1 day before removing adults. Data were collected such that we can examine the effects of the nitrogen regime on percentage aphid survival, length of survival, length of reproduction period, number of offspring produced, etc. This will allow us to determine and separate the exact effects of nitrogen on cotton aphid biology.

These studies were conducted in small plots (4 rows x 20 feet) with differing nitrogen rates (ammonium sulfate) of 0, 50, 100, 150, 200, and 250 lbs. N/A, 200 lbs. N/A split into 4 applications of 50 lbs. each, 200 lbs. N/A + 100 lbs./A of potassium, and 200 lbs. N/A (urea form). Data are still being summarized, but preliminarily aphid survival and reproduction was significantly less in the 0 and 50 lbs. treatments compared with the higher rates.

INTRODUCED NATURAL ENEMIES FOR THE COTTON APHID

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The cotton aphid is found in a variety of habitats throughout the San Joaquin Valley. Management of this insect will in all likelihood require the integration of every management tactic available. In an attempt to enhance one management tactic, biological control, a multi-agency cooperative project was established in 1996. The long-term objective of this project is to build a natural enemy complex for the cotton aphid using natural enemies not currently found in California. This complex should complement the existing natural enemy complex and increase the mortality imparted on cotton aphid populations.

During the past year, investigations have continued on the suitability of three candidate species for inclusion in the natural enemy complex. The three candidate species include two wasps, *Aphelinus* near *paramali*, and *Aphelinus gossypii* Timberlake, and a fungus, *Neozygites fresenii* (Nowakowski) Batko. Investigations were conducted on overwintering ability of the two parasites, and the ability of the natural enemies to attack and possibly reduce densities of cotton aphid in citrus, melons, and cotton.

During the fall of 1998 through the spring of 1999, studies on the ability of the parasites to overwinter were conducted at the Shafter Research and Extension Center. From October1998 through March 1999, 22,500 *Aph.* near *paramali* (ANP) and 41,550 *Aph. gossypii* (AG) were released into the overwintering plot, and this plot was sampled at approximately weekly intervals. Both introduced parasites were recovered with ANP appearing from January through May, and AG appearing from December through April. These recoveries suggest that both parasites can survive the winter in the San Joaquin Valley provided host aphids are present.

Evaluation of the ability of ANP and *N. fresenii* (NF) to attack cotton aphid was conducted from late March through early May using sleeve cages. Within each sleeve cage, a population of cotton aphid was allowed to develop, and then, ANP, NF, or no natural enemies were introduced. The cages were harvested after 14 days, and the contents analyzed. The results of these studies demonstrated no differences in the density of aphids with or without ANP or NF present. However, ANP were produced within the cages, and in the cages receiving fungus, approximately half of the aphids were dead. The rate of infection by NF is still being determined.

Evaluation of the ability of ANP, AG, and NF to attack cotton aphid on melons was conducted from early June through mid July on watermelons ('Calsweet') and cantaloupe ('Top Mark') using cage studies. From these studies, it was determined that the two parasites will not readily attack cotton aphids on watermelon or cantaloupe. The ability of NF is infect cotton aphid on melons is still being determined.

The ability of the three natural enemies to attack cotton aphid in cotton is currently being investigated. For all three natural enemies, both field cage and open field release studies are being conducted. In the field cage studies that have been completed (5 of the anticipated 15 replicates), those cages that had natural enemies present had either the same as or lower density of cotton aphid than the control cages (i.e., no natural enemies present). When the two parasite species were placed together in cages, there was an increase in the number of mummies and parasites produced. This suggests that the two parasites can complement one another in a natural enemy complex. The results from the cages with fungus are pending. In addition, the evaluation of open field releases of natural enemies is currently underway.

This research was supported in part by a grant from the California Cotton Pest Control Board.
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LONG-TERM NITROGEN MANAGEMENT TRIALS

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Summary
The response of Acala cotton in California to a range of applied nitrogen treatments are under investigation in a multi-year, multi-site experiment. Goals of the experiment are to identify crop growth and yield responses to applied nitrogen and to provide information to better assess the utility of soil residual N estimates in improving fertilizer management. Results obtained during the first three years of this project have shown positive responses to increases in applied N across the 50 to 200 lbs N/acre range in only 6 out of 24 test sites (8 locations by 3 years). These findings indicate that while it is still true that 50 to 55 lbs N are needed per bale of cotton produced under CA conditions, more efforts should be put into identifying the amount of plant N requirements that can be met from residual soil N, rather than solely from fertilizer N applications.

Incentives to consider adjusting nitrogen management practices for cotton and other CA crops come from several areas of concern. It has been recognized for many years that mid and late-season nitrogen management has an impact on progress toward defoliation and harvest. High nitrogen levels delay harvest, have a negative impact on the ease and costs of defoliation, and can increase problems with some late-season pests (silverleaf whitefly, aphids) that can influence lint quality. Higher than desired nitrogen levels during bloom and early boll filling can also promote vegetative development at the expense of fruit retention under some conditions. An additional area of concern in recent years has been the fate of nitrogen applied in excess of plant requirements. If plants grown in the rotation sequence do not have deep enough roots to intercept this applied and residual nitrogen, its eventual movement through the soil profile has been shown to cause nitrate contamination of shallow groundwater in a wide range of conditions.

Materials and Methods
In the first full year of the multi-site studies (1996), the fertilizer treatments ranged from a low of 50 lbs total N/acre to 200 lbs N/acre. Four treatments of 50, 100, 150 and 200 lbs N/acre were applied in late May (prior to the first within-growing season irrigation), and in three supplemental treatments (50, 100 or 150 lbs N/acre initially applied), a second N application of 50 lbs N/acre was applied in June just prior to the second (pre-flower) within-season irrigation. In 1997 and 1998, the experiments were simplified down to four basic treatments (50, 100, 150 and 200 lbs N/acre) due to the lack of crop growth and yield responses to split-application treatments as well as grower concerns over the practicality and expenses involved in split applications and potential for damage to plants associated with getting application equipment in

prior to the second irrigation. Soils were sampled at five locations per replication to a depth of 8 feet at all sites for analysis of soil NO3-N, NH4-N, PO4-P and K.

Results and Summary of Data

Soil samples were collected to a depth of 8 feet in May (or in several cases, April) (post-planting) in 1997 and 1998 and again in the Fall (post-harvest) at all field sites and in all N treatments. This report will focus mostly on soil test data from the 1997 studies. When soil N as NO3-N is converted into lbs N/acre-foot of soil volume, and soil bulk density is known or measured, the net changes in soil test N as NO3-N during the growing season (planting to post-harvest) can be calculated.

The wide range of soil NO3-N levels across field sites was again apparent in 1997 (Spring and Fall data) and 1998 (data for spring available for 1998). In the upper two feet of the soil profile in 1997, soil NO3-N concentrations ranged from a low of 9 mg NO3-N/kg soil dry soil to over 35 mg/kg. These soil NO3-N levels corresponded with a range of 34 lbs N as NO3-N per acre in the upper 2 feet of the soil (at a site where cotton followed wheat) to a high of more than 130 lbs N as NO3-N/acre in the upper 2 feet (cotton following corn and processing tomatoes). Soil NO3-N levels in the upper 2 feet of the profile at the Spring 1998 sampling ranged from a low of 37 lbs N as NO3-N per acre at the Shafter REC site to 103 lbs N as NO3-N per acre at the Madera County site in spring of 1998, with an 8-location average of about 65 lbs N as NO3-N/acre

Data indicated that most net depletion of soil NO3-N was seen in the upper four feet of the soil profile. It could be argued that this depletion could result from leaching losses as well as denitrification, but the measured presence of significant root mass at depths down to 6 to 7 feet indicates that plant uptake is another reason for net depletion even at the 4 to 8 foot zone. Most other sites had root activity primarily in the upper 3 to 4 feet of the soil profile. As levels of applied N increased at most sites, soil NO3-N levels in the 4 to 8 foot zone of the soil profile generally increased. Due to surface infiltration characteristics, soil water storage capacity and timing of irrigations, half of the sites in this study (Shafter REC, Kern County, Tulare County, West Side REC) had relatively limited potential for significant leaching of nitrate-N into the lower profile. The Fresno County, Kings County, Madera and Merced County sites had soil types which could allow significant downward water / solute movement under some conditions, but again, soil water storage capacity and irrigation timing and amounts at these sites were managed during the growing season so as to limit downward movement beyond the 8 foot zone measured in this study.

<u>Lint Yields</u>

<u>1996</u>

It is important to get a multi-year, multi-location perspective in analyzing lint yields across these nitrogen treatments. Lint yields in 1996 were moderate across all sites, ranging from lows of about 1000 lbs lint/acre to over 1550 lbs/ acre, and averaging about 1200 lbs/acre across all locations. In all but one of the eight field sites used in 1996, there were no significant effects of nitrogen treatments on lint yields (ie. increasing nitrogen applications did not result in yield responses). There were trends toward increases in yield when 150 lbs N/acre was applied at several sites, but only at the West Side REC was lint yield significantly lower at 50 lbs applied N/acre or 100 lbs applied N/acre than at higher application amounts. Soil residual N levels and release of soil and organic matter N during the growing season under the 1996 growing season conditions could support moderate (by CA standards) yields and acceptable growth with 100 lbs or less of supplemental N/acre.

1997

In 1997, there were more locations showing significant yield reductions with N applications of 50 to 100 lbs N/acre (data not shown). The Tulare County, Merced County and Fresno County locations showed yield reductions at the 50 and/or 100 lbs N/acre levels when compared with higher N applications. Only one location in 1997 showed significantly higher yields with continued increases in applied N all the way through 200 lbs N/acre. Each location with significant responses to increases in applied N had moderate to high yields (in excess of 1500 lbs N/acre), where more N is taken up by the plants and more is required to mature out developing seed. Initial (post-planting) soil NO3-N levels in sites with lint responses to applied N were not uniformly low. Yield responses to applied N were not observed in locations with low initial soil NO3-N levels, regardless of the levels at each site, casting some doubt as to the efficacy of soil residual NO3-N tests for estimating locations with likely responses to applied N.

1998

Results from the 1998 year have to be analyzed in part with some perspective on how unusual a year it was in weather and progression of normal growth patterns. 1998 was a very difficult production year, with cool and wet spring conditions, delayed growth, and abnormal progression of crop development associated with early cool conditions, hot late summer conditions which influenced flower and boll retention, and a cool fall which delayed progress toward defoliation and harvest. Yields were extremely low in fields across most of the San Joaquin Valley. Under these low yield potential conditions, less N is required by developing seed, and it would be expected that responses to applied N would be less than in moderate to high yield years.

Out of eight field sites, only two showed a signficant response to increases in applied N (Fresno County and Kings County sites), and those responses were quite small (in the range of 50 to 80 lbs lint/acre when going from 50 to 150 lbs N/acre at the Kings County site) (Table 5). It is interesting to note that there was a trend at many locations for gin turnout to decrease with increasing applied N, which reduced some of the apparent yield differences seen in seedcotton yieldacross treatments. These results of course are highly dependent upon the soil retentive characteristics, amount of water applied and leaching loss potential, as well as the contributions to soil organic and inorganic N reserves from prior cropping practices. Some of the cotton fields represented in these studies were cotton following a prior crop of cotton, but many were in rotation schemes involving alfalfa, processing tomatoes, small grains, corn or vegetables. This is becoming more typical of the highly diversified agriculture in the San Joaquin Valley. In order to avoid waste of inputs or risk nitrate contamination of groundwater supplies, it is becoming desirable to use yield potential estimates in combination with some measure of soil residual N when deciding upon proper levels of applied N.

Table 1. Lint yield (lbs lint/acre) as a function of location (field site) and N application treatment in 1998.

N applic. Treat-ment (lbs N per acre)	Shafter (40" rows)	West Side REC (40 " rows)	Kern County (38" rows)	Kings County (40" rows)	Tulare County (38" rows)	Fresno County (30" rows)	Madera County (30" rows)	Merced County (30" rows)	Mean across all sites (lbs lint per acre)
50	590	1189	1159	1163	971	1233	1006	1127	1029
100	633	1289	1110	1092	1014	1260	987	1108	1033
150	612	1274	1154	1267	997	1317	1031	1078	1058
200	597	1280	1147	1236	1052	1311	1021	1083	1059

It is also important to note that recent work the principal investigators have conducted in the San Joaquin Valley largely confirms earlier work in CA and Israel which indicated that about 50 to 55 lbs Nare needed per bale of cotton produced. These results are important in light of the lack of yield response noted in current studies across a wide range of applied N. The results of the current study do not indicate that only 50 or 100 lbs of N/acre are needed to produce 1200 or 1600 lbs lint/acre, but rather indicate that soil residual N (from various forms) can serve as a major source of N in meeting crop nitrogen requirements. It is to be expected that when the N "load" or requirements are much higher due to a high fruit set, there will be more yield separation across a range of applied nitrogen. Growers need higher yields to effectively compete and achieve profitability in 1999 in CA cotton. It would also be very useful in this project to have several more data sets representing responses to applied plus residual N under moderate to high yield conditions to give more balance to the "picture".

MANAGEMENT OF KEY COTTON ARTHROPOD PESTS WITH INSECTICIDES AND ACARICIDES

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Introduction:
Integrated pest management is an accepted tool in dealing with cotton pests. Insecticidal control of the key cotton arthropod pests in California is a major component of our cotton IPM programs. Are insecticides the only answer and a long-term solution? No, for several reasons. First, insecticides must be compatible with biological control; this natural control is very important in California cotton. Studies should be conducted to determine the effects of registered and new insecticides on natural enemies and therefore the best means to integrate these two tactics. Changes in registration guidelines, such as the Food Quality Protection Act, alter the available suite of insecticides. This requires constant attention. Resistance build-up in pests render some materials ineffective and means that new products have to be worked into the system. Finally, new products are being developed and must be evaluated under California conditions. Therefore IPM programs must be continuously refined because of emerging new pests, different cotton varieties, varying agronomic/production practices, changing insecticide resistance patterns, and new registered insecticides.

We have evaluated product efficacy on spider mites (1997 and 1998), cotton aphids (1997), and lygus bugs (1997) at the West Side Research and Extension Center and on lygus bugs, cotton aphids, and spider mites at Shafter Research and Extension Center in 1998. Different issues surround integrated management for each of the key arthropod pests of cotton. In summary, maintaining susceptibility is of utmost importance in spider mites. In addition, the array of products all have some limitations and niche uses so what looks like a long list of products really isn't. The difficult to control spider mites at Shafter in 1998 resulted in research plot work being done at that location in 1999 to further evaluate this. The primary issue for lygus bug management in SJV cotton is selectivity and effects on beneficials. These treatments are generally applied first during the growing season when populations of natural enemies are expanding. Several products, namely pyrethroid insecticides provide excellent lygus bug control, but they are toxic to predators and parasites. This hastens and promotes outbreaks of spider mites and particularly cotton aphids.

A selective, but highly effective lygus material is severely needed. One product thought to fill this void, Regent®, flared spider mites in my 1998 testing. This warranted further research in 1999. Cotton aphid is the third major arthropod pest on SJV cotton. During the squaring and boll-filling period, high populations of cotton aphids can develop. Control of cotton aphids with insecticides is erratic. Following repeated exposure, aphids develop insecticide resistance quickly; in addition, cotton aphid control with insecticides is influenced by environmental and agronomic conditions. Additional research on cotton aphid control was conducted in 1999.

There are numerous new products that are in the registration pipeline. Most of these products fulfill the "reduced risk" guidelines put forth by EPA and they are characterized by low toxicity to mammals, specificity to pests, short residual, etc. The FQPA actions to ban many of the existing insecticides has fueled these efforts. Microbial products, insect growth regulators, fermentation products from microbes, anti-feedants, etc. are all being developed. The research community has clamored for these less toxic alternatives for many years; now the challenge is to determine how these products can best be used.

PROTOCOL:

Replicated field plots were established to evaluate the effect of registered and experimental compounds on cotton aphids, spider mites, and lygus bugs. The spider mite work in 1999 was conducted at the Shafter Research and Extension Center and the lygus bug test was done at the West Side Research and Extension Center. These locations were reversed in 1998. Cotton aphid studies were done at Shafter as in 1998. Spider mites treatments were applied to plots 6 rows by 75' with 4 replicates on 20 July. The standard registered materials (Kelthane®, Comite®, Zephyr®, Savey® were examined as well as two reduced risk "organic" products. No experimental miticides were available for testing in 1999. Two additional treatments of Regent (an experimental lygus material) were included to see if it flared mite populations as in 1998. Leaf samples for evaluation purposed were collected at 7, 14, 21, and 28 days after treatment. All data are presently being summarized.

A late-season aphid test was established on 7 September. Efficacy with Fulfill®, Furadan®, Provado®, Lorsban® and Bollwhip® were compared. Data were collected at 3, 7, 10, and 14 days after treatment.

MANAGING ROOT-KNOT NEMATODES IN COTTON: EVALUATING ALTERNATIVE AND REDUCED RISK APPROACHES

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Cotton root-knot nematode is the most important nematode pest to cotton with losses averaging 33,360 bales/year during the period 1989 through 1998. This pest is a problem primarily in sandy and sandy-loam soils, but can be found in loamy soils.

The emphasis on reducing costs and improving profitability is a driving factor for research focused on finding alternative management approaches to fumigants and other nematicides. In addition, interest by society and regulators in seeking reduced risk approaches to pest management is driving the search for alternative nematode control practices.

Beginning in 1994, experiments have been conducted at Shafter REC to examine the role of crop rotation and the use of resistant Acala variety, NemX, to suppress root-knot nematode populations. The results of these experiments have been reported (1,2) but can be summarized as follows:

- NemX cotton maintained yield potential over three years while Maxxa declined during each year of the trial (Figure 1)
- NemX cotton suppressed the root-knot nematode population while Maxxa maintained the population (Figure 2)
- Traditional crop rotations decrease root-knot nematode populations (Figure 3) but NemX was as effective as alfalfa or black-eye beans
- Using NemX provided significant yield gains for a susceptible vegetable (Henderson bush lima beans)

One of the drawbacks of the 1994-1996 trials was the unavailability of Telone II as a fumigant check. In 1997, another trial was initiated to repeat the experiment with a fumigated check incorporated. The trial is in its third year and consists of 240 plots spanning all combinations from three years of fumigation or no fumigation and three years of Maxxa or NemX. Thus far we have learned:

- Fumigants still protect susceptible cotton (Figure 5)
- Fumigants in 1998 increased yield of both Maxxa and NemX (Figure 6)
- NemX continues to suppress root-knot nematode populations (Figure 7) as indicated by increased yields of susceptible lima beans but control decreases as Telone use decreases

These trials have demonstrated that root-knot nematode is manageable by cultural means, such as crop rotation and host plant resistance. However, care must be taken to prevent root-knot nematode from overcoming the resistance. These studies were conducted in the same field for six consecutive years and probably are providing selection pressure on the population overcome it. *Under normal farming practices, NemX might be used the final year in a three or four-year cotton rotation, followed by a rotation to a non-host or a fumigation prior to vegetables.*

The use of NemX in during a cotton rotation provides an excellent opportunity for California growers to manage their root-knot nematode populations. Cotton acts a filter to prevent the buildup of all other *Meloidogyne* (root-knot nematode) species. NemX will limit the buildup of the population prior to vegetables, thus providing a smaller population for a Telone II to control. If the rotation is to alfalfa or beans, susceptible cotton (non-NemX Acala, Pima, and CA upland) can follow with no nematicide in most situations.

Sampling for nematodes is the only way to base a management decision. In field that is out of cotton, a soil sample is required from every 10-20 acres. For a field currently in cotton, a Fall root-sample will help decide whether to plant NemX or rotate out of cotton. Using the root-sample method, a field can be evaluated by examining the root systems and rating them for nematode damage. Details for both root-evaluation and soil sampling methods can be found in the Cotton IPM Manual (3) and Cotton Production Manual (4).

References:

1. Ogallo, J.L., P.B. Goodell, J. Eckert, and P.A. Roberts. 1997. Evaluation of NemX, a new cultivar of cotton with high resistance to *Meloidogyne incognita.* Journal of Nematology: 29 (4): 531-537.

2. Ogallo, J.L., P.B. Goodell, J. Eckert, and P.A. Roberts. 1999. Management of root-knot nematodes with resistant cotton cv. NemX. Crop Science. 39:2:418-421.

3. IPM for Cotton in the Western U.S. UC DANR Publication 3305.

4. Cotton Production Manual. UC DANR Publication 3352.

Figure 1. Cotton yield at Shafter REC with three years (1994-96) of resistant (NemX) or susceptible cotton (Maxxa).

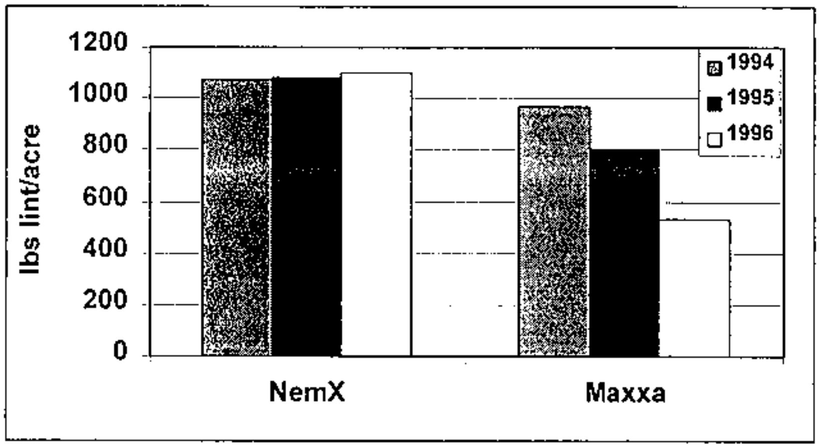

Figure 2. Root-knot nematode population pre-plant densities (Spring) under three years (1994-96) of resistant (NemX) or susceptible cotton (Maxxa).

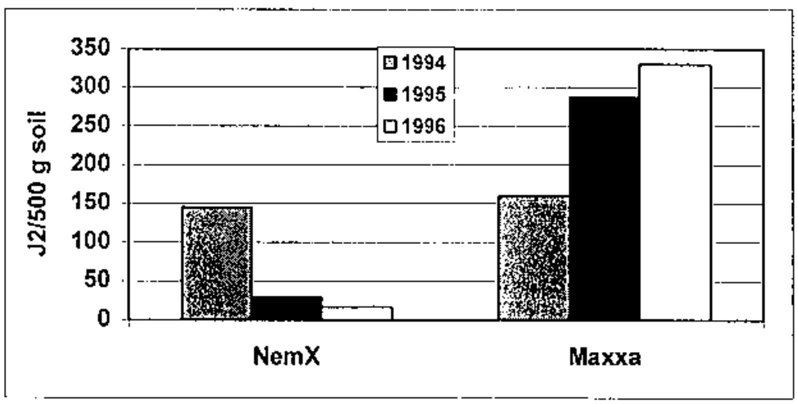

Figure 3. Pre-plant densities of root-knot nematode (January 1996) following one year rotations of different crops.

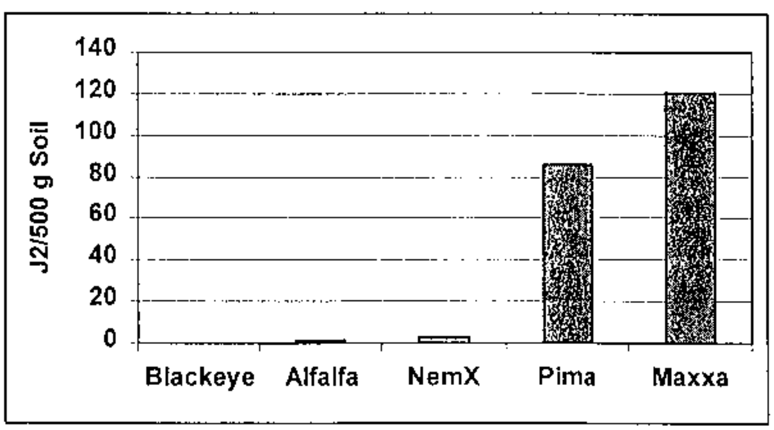

Figure 4. Yield of lima beans (whole plant green weight) following NemX (R) or Maxxa (S) cotton in 1995 (1) or 1996 (2).

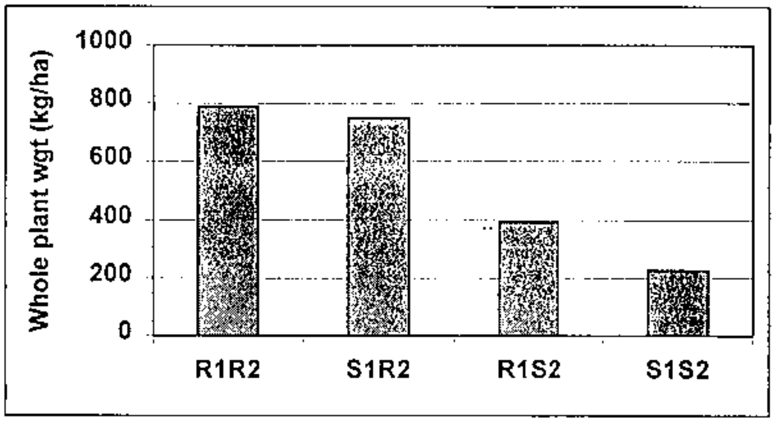

Figure 5. Lint yield in 1997 for resistant (NemX) or susceptible (Maxxa) cotton with or without nematicides.

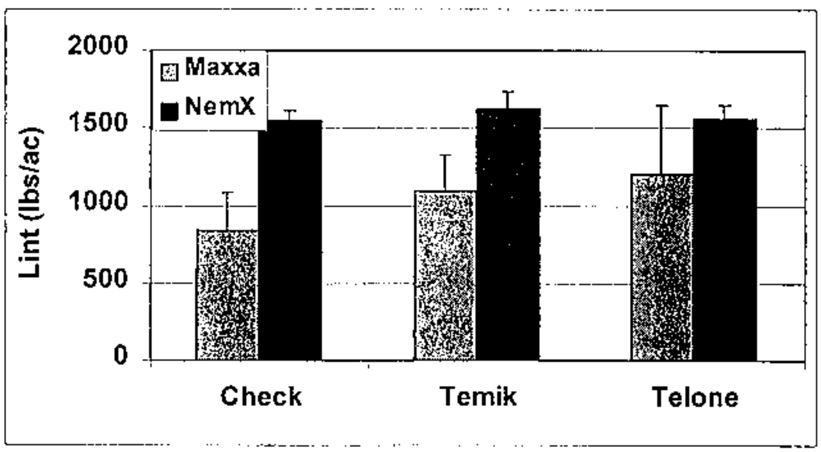

Figure 6. Lint yield in 1998 for resistant (NemX) or susceptible (Maxxa) cotton with or without fumigant.

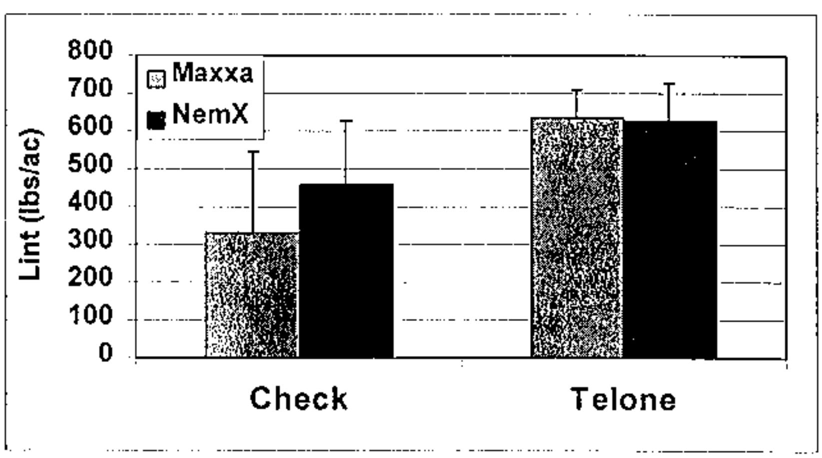

Figure 7. Green weight yield of Henderson lima bean following 1 or 2 years with or without fumigation and growing resistant (NemX) or susceptible cotton (Maxxa). See Table 1 for treatment code. Zero indicates 3 years of Telone, 3 indicates no Telone since 1996.

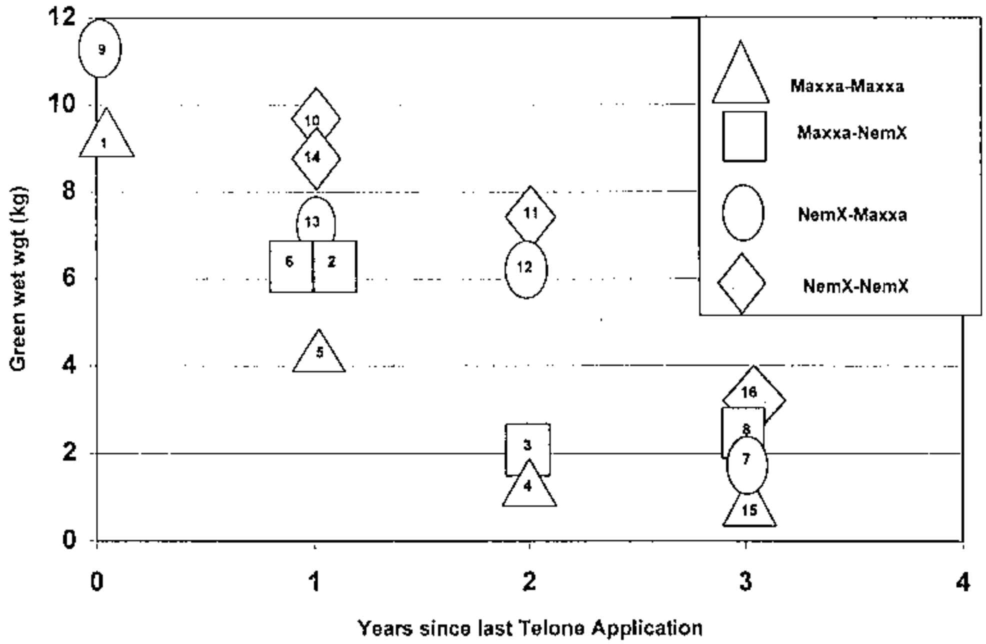

Table 1. Summary of treatments at nematode management trial, Shafter REC, 1997-1999.

	Year		
Treatment No.	1997	1998	1999
1	Telone, Maxxa	Telone, Maxxa	Telone
2	Telone, Maxxa	Telone, NemX	
3	Telone, Maxxa	NemX	
4	Telone, Maxxa	Maxxa	
5	Maxxa	Telone, Maxxa	
6	Maxxa	Telone, NemX	
7	Maxxa	Maxxa	
8	Maxxa	NemX	
9	Telone, NemX	Telone, Maxxa	Telone
10	Telone, NemX	Telone, NemX	
11	Telone, NemX	NemX	
12	Telone, NemX	Maxxa	
13	NemX	Telone, Maxxa	
14	NemX	Telone, NemX	
15	NemX	Maxxa	
16	NemX	NemX	

SJV COTTON BOARD
ACALA, PIMA AND UPLAND TESTING PROGRAM - 1998

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The unprecedented weather conditions of 1998 dominated the season. With abnormally cold temperatures both in the spring and in the fall, the most abbreviated growing season ever experienced took a heavy toll on production. Even with a full month delay in harvest, many bolls failed to open - a result of too few heat units to mature the late set. In these tests average yields of all carry-over entries were more than a bale an acre below that of the same variety the year before. In general, quality was not detrimentally affected, but because of the exceptionally adverse conditions varietal relationships, especially as it relates to yield, are not necessarily what might be expected in a more normal year.

Acalas

Some changes were made in the Acala testing program for 1998 to hasten the process for variety approval, particularly for some of the new transgenics. With pending legislation at the time to allow for a shortened approval process, the small trials where we initially screen large numbers of cottons were omitted; instead new entries moved directly into the large scale field length plots at eight locations. To accommodate a larger than normal number of first time entries into these trials - a total of eighteen varieties - these were planted in separate tests, while the carry-over entries were planted in adjacent plots.

All four Acalas that completed the testing cycle; BR-9605, OA-207, C-165 and C-166 were approved. The first three essentially equaled or else exceeded the yield of the Maxxa standard. Though C-166 did not reach the Maxxa yield level, its gossypol-free seed characteristic - the first such variety ever to be approved in the program - has the potential to increase the total market value of the seed and lint. On balance, the first three equaled or slightly exceeded the standard in fiber and yarn quality while the C-166 significantly exceeded the standard in most of these measurements. Although Verticillium wilt was not a dominating factor at any location, the BR-9605 and, to a lesser extent, C-166 expressed more symptoms than Maxxa.

Uplands

Though not a part of the regular trials, from the inception of the testing program we have monitored the performance of leading out-of-state varieties (designated National Standards) in small scale plots at selected locations. Until the most recent of the 3-year testing cycles that these varieties undergo, none of them - with one minor exception – have exceeded either the yield or the quality of the standard Acala variety. However, in the most recently completed cycle, two of them, though of lesser quality, did significantly out yield the Acalas. With the interest generated from recent reports on several of the newer non-Acala types, a greatly expanded program was put in place for the 1998 season to more fully explore the yield and quality potential of some of these cottons in the San Joaquin Valley. A total of nine varieties were entered into these trials, six "Upland" entries submitted from as many breeding programs, both in state and out-of-state, and three approved Acalas for comparison. These were tested in replicated field length plots either adjoining the regular Acala tests or in a nearby field. As with the Acala tests, the full array of measurements was made with respect to yield, agronomic traits, and fiber quality and spinning performance. Results from these tests have been detailed in reports to the board and have been summarized in the California Cotton Review and other venues. The generally more rapid fruiting and maturation of the "non-Acala" types proved advantageous for yield, particularly in a year such as this. The largest yield disparity between the "Upland" and Acalas occurred at sites where overall yields were most severely depressed. Among the "Uplands" there was a considerable range in quality traits. Though the better of these approached Acala quality in some respects, none of them equaled the Acalas in overall spinning performance, particularly in the finer counts.

Pimas

To better represent the increasing acreage being planted to Pima the number of test sites was increased from three in past years to four in 1998 and five in 1999. As with the Acalas, the tests are planted in replicated plots running the length of the field, usually 1/4 mile. Production and quality measurements are similar to that for the Acalas except that the samples are processed into the finer 50's and 80's count combed yarns.

Two entries, OA-337 and UA-4, competed the 3-year testing cycle and were approved. The growth characteristics of OA-337 are similar to S-7, but the UA-4 has a slightly taller growth habit than the standard and it exhibits significantly less leaf bronzing and senescence in areas where this occurs. Overall yields of both were within 5 percent of the standard. With regard to quality the UA-4 shows slightly better strength and significantly improved fineness and maturity. The OA-337, also called "White Pima", as the name implies has a whiter lint than the normal cream color.

New Legislation

As all are aware, the past year has seen some dramatic developments in the San Joaquin Valley cotton industry. In an attempt to salvage what little season was left, in May of last year an emergency exemption was obtained permitting shorter season non-Acala varieties to be planted. It was eventually decided to implement permanent legislation permitting any variety to be grown. The legislation finally put in place provides for both the Acala and Pima testing programs to continue as they have in the past, with only the mandatory aspects related to commercial plantings no longer in force. The approved varieties will be known as "SJV Acalas" and "SJV Pimas"; other varieties grown in the valley will be designated "California Uplands" and "California Pimas". Regulations were adopted to properly identify bales of approved varieties as distinguished from all other Upland and ELS varieties. As long as this is successful it may well be that approved Acala and Pima growers will benefit from an enhanced premium, while giving all producers greater flexibility in their planting decisions.

UCCE APPROVED ACALA VARIETY TRIALS

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1998 Studies

Eleven approved Acala varieties were planted in tests in 1998. Varieties included the standard, Maxxa, plus Phytogen-33, SJ-2, GC-510, Royale, DPL-6204, GC-535, C-141, GTO Maxxa, GC-500 and DP-6211. Tests were located in each of the six San Joaquin Valley cotton-producing counties, plus the Shafter and West Side Research and Extension Centers of the University of CA. Tests in grower fields were large scale, with individual entries grown in 6 to 8 row width plots averaging 1300 feet or more in row length. All studies had 4 replications in a randomized complete block design. Studies at West Side and Shafter locations were smaller, with plots 4 rows in width by 300 feet length. Planting dates, soil type and management practices varied across the locations and with grower differences in inputs and management approach.

It is important to note that the list of varieties in the "approved variety trials" does not include all varieties currently approved for the San Joaquin Valley. Entries included newly-approved varieties for the current year, varieties released last year that are in their second year of testing, plus the top 6 or 7 previously-approved varieties (in terms of planted acreage). The new varieties are the focus of the tests, but they only remain in the tests for the first two year following release unless that variety moves into the top 6 or 7 varieties in planted acreage. Released varieties also may not show up in the tests if the seed companies request that the variety is for a special market and don't want it in multiple location testing. All plots were machine harvested, with six pound seedcotton samples ginned at Shafter. Fiber samples were sent to the USDA Classing Office for HVI fiber quality analyses. Twenty-five plants were evaluated per replication (only in the SJ-2 variety) for presence or absence of vascular streaking and leaf discoloration as an index of incidence of Verticilium wilt at test locations.

Lint yields averaged 1092 lbs/acre (over all varieties and locations). In comparing across recent years in the UCCE Approved Acala Variety trials, the 1092 lbs/acre average in 1998 is 17 percent higher than the 1995 average (935 lbs/acre), 19 percent lower than the 1996 average (1353 lbs lint/acre), and 28 percent lower than the 1997 average (1525 lbs/acre). While the average yields across farm locations in these variety trials is over 200 lbs/acre higher than the USDA estimates (December, 1998) for statewide average yields (about 860 lbs/acre), the low yields of 1998 are some of the worst in many years in parts of CA.

Statistical separation of variety yields is indicated by the LSD (least significant difference) test results (Table 1). Lint yields and gin turnouts which are separated by the amount shown in the LSD column (or more) are statistically different. Looking at 8-location averages, 3 varieties had statistically higher yields than Maxxa. Phytogen-33 average yields were 5 percent (58 lbs/acre) higher than Maxxa, GTO Maxxa was 4 percent (41 lbs/acre) higher, while DP-6211 was 4 percent (46 lbs/acre) higher than average Maxxa yields. All other varieties produced 93 to 102 percent of Maxxa yields.

The incidence of Verticilium wilt was generally quite low in this test, with only one site experiencing a "high" wilt rating (26 percent of plants affected in Tulare County location. Gin turnouts were lower than recent years, with an average over locations and varieties being 32.6 percent in 1998 (Table 1) versus 36.2 percent in 1997.

Table 1. Lint yields, gin turnouts, statistical analyses in 1998 Acala Approved Variety Trials.

Variety	40" Shafter REC	40" West Side REC	40" Kern Co.	38" Kings Co.	38" Tulare Co.	30" Fresno Co. *	30" Madera Co.	30" Merced Co.	Mean Lint Yield (lbs/ac)	Lint Yield (as % of Maxxa)	Mean Gin T.O. (%)
Maxxa	**747**	**1285**	**818**	**1275**	**985**	**1304**	**1213**	**1089**	**1090**	**100**	**33.4**
Phy-33	956	1395	1009	1280	1031	1174	1191	1144	**1147**	105	**31.3**
SJ-2	840	1213	771	1326	1000	1121	1168	1069	**1063**	98	**30.1**
GC-510	747	1236	908	1177	891	1175	1117	866	**1015**	93	**32.3**
Royale	852	1213	947	1227	981	1184	1030	995	**1054**	97	**32.5**
DP6204	917	1195	940	1287	994	1203	1073	1045	**1082**	99	**30.8**
GC-535	845	1236	927	1253	996	1277	1133	1003	**1084**	99	**32.0**
C-141	886	1272	908	1372	993	1312	1161	1023	**1116**	102	**32.3**
GTO Maxxa	954	1362	854	1390	1026	1365	1042	1053	**1131**	104	**36.4**
GC-500	827	1228	876	1284	1034	1256	1152	1063	**1090**	100	**33.4**
DP6211	918	1301	953	1346	1030	1283	1200	1057	**1136**	104	**33.7**
MEAN	**863**	**1267**	**901**	**1292**	**996**	**1241**	**1135**	**1037**	**1092**	**100**	**32.6**
LSD 0.05	100	56	47	60	70	130	NS	82	33		
C.V. (%)	8.0	3.0	3.6	2.7	4.9	7.3	8.5	5.5	6.0		
P	0.001	0.000	0.000	0.000	0.016	0.016	0.129	0.000	0.000		
Wilt Rating % incidence	0	2	2	10	26	9	1	5			

* = Average gin turnout from other 7 locations used with Fresno Co. site seedcotton yields to determine lint yield
C.V. = coefficienct of variation; P = probability
VARIETY by LOCATION (for yields): (LSD 0.05 = 101; C.V. (%) = 6.7; P = 0.000)

1999 Studies

Eight county test sites were selected for the 1999 County Approved Acala Variety trials. Even though very cool, sometimes wet conditions occurred during the entire month of March and the first few days of April, most of the test plots were planted between April 15 and April 23.

Six of the tests are large-scale evaluations at grower sites in Kern, Tulare, Kings, Fresno, Madera and Merced counties. At these locations, trials range from 800 foot runs to 2600 foot run lengths. Four replications were used at all locations. In addition, there are two smaller tests at both the University of CA Shafter Research and Extension Center and the West Side Research and Extension Center. Even in these smaller tests, plot sizes remain 300 feet in length by four rows in width.

A total of twelve Upland varieties were planted at each of the test sites, including ten Approved Acala varieties and two non-Acala Upland varieties. The San Joaquin Valley Cotton Board has adopted a standard for naming non-Acala Upland varieties; they will be called "California Upland" varieties. The Acala varieties included in the test include Maxxa, GTO Maxxa, Phytogen-33, DP-6211, SJ-2, GC-500, C-141, and three new releases for this year (DP-6207, BR-9605, C-166). The California Upland varieties included in the test for comparison purposes are DP-Nucotton-33B and Stoneville BXN-47.

UCCE APPROVED PIMA VARIETY TRIALS

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1998 Studies

The objectives of these studies with Pima are to evaluate approved varieties under different environmental conditions and management. The studies are part of a regional Beltwide Pima variety evaluation that includes Texas, New Mexico, Arizona and California, and are supported in part through the California Crop Improvement Association. In addition to five grower fields, two UCCE Research Center test locations were used in the 1998 trials, the West Side and Shafter Research and Extension Centers of the University of California. The West Side location is in a clay loam soil with an soil profile largely unrestricted to rooting to a depth of 6 feet or more, while the Shafter location is a sandy loam soil with surface infiltration problems which limit mid- and late-season irrigation water penetration and effective rooting depth to 2 to 3 feet in the mid- to late-season. Seven approved Pima varieties were included in the test: S-7 (the current standard), S-6, CH-252, Conquistador and Oro Blanco. Both trials were a completely randomized design with four replications, with all varieties planted in 40 inch rows in four-row plots 280 feet in length.

In order to provide a reasonable limit on the number of varieties in the tests, the entries include newly-approved varieties for the current year, varieties released last year that are in their second year of testing, plus the top 4 or 5 previously-approved varieties (in terms of planted acreage). The new varieties are the focus of the tests, but they only remain in the tests for the first two years following release unless that variety moves into the top 4 or 5 varieties in planted acreage. Released varieties also may not show up in the tests if the seed companies request that the variety is for a special market and don't want it in multiple location testing, or when inadequate seed supplies exist for large-scale testing.

The number of test locations was expanded considerably in 1998 in response to increasing interest in Pima plantings and the desire for a broader base of information on varietal performance. Pima variety trials are supported in part through grants from the California Crop Improvement Association. Approved Pima varieties included in the tests are shown in Table 1 and 2. Results for the four varieties grown at seven locations are shown in Table 1, while data for the seven varieties in the four locations are shown in Table 2.

Across all locations and varieties, 791 lbs of lint per acre were produced in the Pima Approved Variety Trials this year, compared with 1703 lbs/acre in 1997 and 1256 lbs/acre in 1996 trials. Planting dates in 1998 trials ranged from April 17 to May 9, and plants in most locations suffered from delayed development and flowering due to cool conditions that prevailed into mid-June. Pest problems (lygus in many locations, spider mites in two locations) were major causes of early and mid-season losses in many locations, resulting in poor boll retention at many sites.

Lint quality was generally very good. In the 4-location trials which included all seven approved varieties, micronaire averaged 4.07 (ranged from a low of 3.90 in Phy-57 to a high of 4.13 in Oro Blanco), length averaged 1.36 inches (ranging from a low of 1.34 in S-6 to a high of 1.38 in Oro Blanco) and strength averaged 41.4 g/tex (ranging from a low of 39.3 in S-6 to a high of 42.5 in Conquistador).

Table 1. Lint yields (in lbs/acre) by test location and average gin turnout for each variety in 1998 Pima Approved Variety Trial (7 locations with 4 varieties evaluated).

Variety	40 inch Shafter REC	40 inch West Side REC	40 inch Kern Co.	38 inch Tulare Co.	38 inch Tulare Co.	38 inch Fresno Co.	40 inch Fresno Co.	Mean Lint Yield (lbs lint / acre)	Mean Lint Yield (as % of S-7)	Mean Gin Turn-out (%)
S-7	960	873	814	1110	597	738	843	848	100	29.4
CH-252	657	666	621	781	307	689	797	646	76	29.6
DP-HTO	971	939	857	1078	618	752	850	866	102	33.2
Phy-57	832	905	880	863	490	737	976	812	96	28.7
MEAN	855	846	793	958	503	729	867	793		30.2
LSD 0.05	220	89	73	141	110	33	119	34		
C.V. (%)	16.1	6.6	5.7	7.3	13.7	2.8	8.6	7.1		
P	0.034	0.000	0.000	0.003	0.001	0.010	0.040	0.000		

C.V. = coefficienct of variation; P = probability
VARIETY by LOCATION interaction (for yields): (LSD 0.05 = 126; C.V. (%) = 11.3; P = 0.002)

These tests do not perform the same function as the Pima Advanced Strain screeing trials or limited large-scale tests done as part of the San Joaquin Valley Cotton Board trials coordinated by Dr. Dick Bassett of the University of CA. The Cotton Board tests are used to initially collect information on yield and quality performance of varieties entered in the Approved Pima variety program. Those entries have one year in screening trials, followed by two years of field trials at three field locations. Entries with acceptable yields and quality (relative to the current standard, S-7) can be recommended for "Approval" by the San Joaquin Valley Cotton Board.

The tests supported by this project give growers a continuously-updated comparison of newly-available varieties versus those varieties which have been available for one or more years. This data base has been significantly improved in 1998 by increasing the number of test locations to include 7 sites, instead of the 3 locations used in 1996 or 2 locations used in 1997. Grower confidence in the utility of these tests has been improved with this marked increase in number of locations, and we hope to continue this expanded testing in the future. This is particularly important in light of continuing increases in Pima acreage expected for 1999 .

1999 Studies

Six county test sites were selected for the 1999 County Approved Pima Variety trials. Even though very cool, sometimes wet conditions occurred during the entire month of March and the first few days of April, most of the test plots were planted between April 13 and April 22. Four of the tests are large-scale evaluations at grower sites in Kern, Kings, Fresno, and Merced counties. At these locations, trials range from 800 foot runs to 2600 foot run lengths. Four replications were used at all locations. In addition, there are two smaller tests at both the University of CA Shafter Research and Extension Center and the West Side Research and Extension Center. Even in these smaller tests, plot sizes remain 300 feet in length by four rows in width.

A total of six Pima varieties were planted at each of the large-scale county test sites, including S-7 (the SJVCB "standard", DP-HTO, CH-252, Phytogen-57, DP-White Pima and UA-4. Only "approved" varieties according to the San Joaquin Valley Cotton Board were included in these trials. The San Joaquin Valley Cotton Board has adopted a standard for naming non-approved Pima varieties; they will be called "California Pima" varieties. Eight varieties were included in smaller-scale tests at the West Side and Shafter Research and Extension Center sites, including DP-HTO, S-7, CH-252, DP-White Pima, Phytogen-57, UA-4, S-6 and Conquistador. These last two varieties (S-6 and Conquistador) were included in the two field station trials this year at the request of the coordinator (Dr. Richard Percy, USDA-ARS, Maricopa, AZ) of the National Standards Pima test, to include key varieties entered in the National Standards trials in other states.

Table 2. Lint yields (in lbs/acre) by test location and average gin turnout for each variety in 1998 Pima Approved Variety Trial (4 locations with 7 varieties evaluated).

Variety	40 inch Shafter REC	40 inch West Side REC	38 inch Fresno Co.	40 inch Fresno Co.	Mean Lint Yield (lbs lint / acre)	Mean Lint Yield (as % of S-7)	Mean Gin Turnout (%)	Mean Lint Yield in 1994-1997 UCCE Tests (as % of S-7)
S-7	960	873	738	843	853	100	29.3	100
CH-252	657	666	689	797	702	82	29.6	95 *
Oro Blanco	658	689	729	752	707	83	30.2	91
Conquistador	963	798	683	805	812	95	28.8	99
S-6	796	629	673	752	712	83	30.1	90
DP-HTO	971	939	752	850	878	103	32.9	94 *
Phy-57	832	905	737	976	862	101	28.8	101 *
MEAN	834	786	714	825	789		30.0	
LSD 0.05	168	107		87	68			
LSD 0.10			53					
C.V. (%)	13.6	9.2	6.1	7.1	11.5			
P	0.001	0.000	0.100	0.001	0.000			

VARIETY by LOCATION Interaction (for yields): (LSD 0.05=NS; % C.V. = 2.8; P = 0.132)

UC RIVERSIDE BLACKEYE IMPROVEMENT PROGRAM

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Blackeyes are a well-adapted and generally profitable rotation crop for many cotton growers in the southern San Joaquin Valley. Nematode resistant blackeye varieties help reduce soil levels of *Meloidogyne incognita* root-knot nematodes and increase soil fertility for the benefit of succeeding cotton crops. Improved varieties are needed for the California blackeye industry to remain competitive with other producing areas such as the High Plains of Texas. UC Riverside has been breeding and testing improved blackeyes for nearly twenty years. The Shafter Station has been an ideal, representative yield-testing site for the products of our breeding program for the last seven years. As a result of these efforts, we released the blackeye variety California Blackeye No. 27 (CB27) in 1999. (See attached description of CB27). CB27 has high yield potential (see Table 2), heat tolerance, improved broad-based resistance to root-knot nematodes (*Meloidogyne incognita* and *M. javanica*) and resistance to the two races of Fusarium wilt present in California (see Table 1). CB46 only has strong resistance to one race of Fusarium wilt and to only one of three strains of root-knot nematodes present in California. CB27 also has seed that is brighter white than CB46 and generally larger in size.

We are conducting three field experiments on the Shafter Research Station in 1999. These experiments were planted May 11, 1999.

Blackeye Uniform Trial: We are evaluating the grain yield and grain quality of 10 advanced blackeye breeding lines from the UCR and UCD blackeye breeding programs, the standard variety 'CB46' and the recently (June 1999) released variety 'CB27' under early sown, long season (>130 days) management. Most entries in this trial have resistance to two races of Fusarium wilt and some have stronger resistance to root-knot nematodes than CB46 (Table 1). This trial is part of a set of 'Uniform Trials' with common entries conducted jointly by the UCR and UCD programs at three locations in the San Joaquin Valley.

Row Spacing Trial: With the development of newer compact blackeye varieties such as CB46 and the recently released CB27, a re-examination of variety x row spacing effects was warranted. We are evaluating the agronomic performance of 6 lines with contrasting plant habit (3 compact lines-CB46, CB27, and H36, and 3 viny lines-CB5, H8-8-1N, and UCD 8517, under single row, 30" bed, single row, 40", and double row, 40" bed systems. In a similar trial conducted at the Shafter Station in 1998, compact lines produced higher grain yields (avg. yield of 2890 lb/ac) and had higher harvest indices (avg. 47.9 %) than viny lines (avg. yield 2350 lb/ac and harvest index 39.7%) over the three production systems. Compact varieties produced their highest yields (avg. 3108 lb/ac) under the single-row 30" bed and double-row 40"bed systems. Viny varieties produced their highest yields at the single-row 40"bed) system (avg. yield of 2519 lb/ac). We anticipate similar results this year. This experiment was cut on August 27, 1999.

Screening for Lygus Resistance: Varieties with resistance to lygus bugs are needed to reduce the need for costly insecticides and because of increasing constraints on the use of pesticides. Sources of strong lygus resistance still need to be identified. We obtained a set of 144 germplasm lines native to Italy are screening these for resistance to lygus. Each accession was planted in a single row plot with two replications and frequent placement of CB46 check rows. No insecticide was applied to the crop. We had planned to evaluate the lines for their ability to flower, produced pods, and produce seeds free from lygus seed 'sting' damage. Unfortunately, lygus pressure was very low this season on the Station and consequently, it was not possible to differentiate levels of resistance.

Description of 'California Blackeye No. 27'

'California Blackeye No. 27' (CB27) was developed by the University of California, Riverside (UCR) and released by the California Experiment Station in 1999. CB27 is an erect, compact blackeye that has heat tolerance and broad-based resistance to Fusarium wilt and root-knot nematodes. CB27 was evaluated in performance trials conducted in California from 1994-1998 under the designation H8-8-27.

CB46, CB88 and CB5 carry the nematode resistance gene *Rk* that confers strong resistance to common strains of *Meloidogyne incognita* root-knot nematode. CB27 carries gene *Rk* and another recessive gene that act together in an additive fashion to provide greater protection against *Rk*-virulent forms of *M. incognita* and *M. javanica* root-knot nematodes. Reproduction and root-galling on CB27 caused by *Rk*-virulent *M. incognita* and *M. javanica* are about half those observed on CB46 and CB88.

CB27 has resistance to both Race 3 and Race 4 of Fusarium wilt, while CB46 and CB88 only have resistance to Race 3 of this disease. CB5 is susceptible to both Race 3 and Race 4. Race 3 is the predominant race of Fusarium wilt in California. Additional fields with Race 4 were identified in 1997 and 1998, suggesting that this race may be wide-spread.

CB27 has out-performed CB46 and CB88 in trials conducted in Stanislaus, Co. in 1995 and 1996 where Fusarium wilt Race 4 and gene *Rk*-virulent *M. incognita* root-knot nematodes were present. The average yield of CB27 was 2280 lb/ac, while CB46 yielded 1870 lb/ac, and CB88 yielded 1090 lb/ac.

In fields free from Race 4 Fusarium wilt and *Rk*-virulent root-knot nematodes, CB27 and CB46 had similar average grain yields (3870 and 3880 lb/ac, respectively) over sixteen replicated yield trials that were conducted at several sites in the San Joaquin Valley from 1995-1998. These trials were conducted on raised beds with furrow irrigation using row spacing and management systems typical of commercial fields in the San Joaquin Valley. Due to its compact growth habit, CB27 performs well on double-row 40" raised bed systems, and single-row 30" raised bed systems, but is less well suited for single-row 40" raised bed systems. CB27 has produced greater yields than CB46 in hot conditions that often occur in the southern San Joaquin Valley.

Foliage characteristics of CB27 are similar to CB5, CB46 and CB88. For example, it has white flowers, red pigmentation at the stem and branch nodes and similar foliage color, leaf size and shape. With a May sowing date and typical growing conditions in the San Joaquin Valley, CB27 begins flowering in about 52 days and matures its first flush of pods in about 95 days from sowing. CB27 has an erect 'bush' growth habit and is substantially more compact than CB5 and CB88, and slightly more compact than CB46.

CB27 has a brighter white seed coat than CB46. The seed shape is similar to CB5, slightly flatter and less round than CB46. The 100-seed weight of CB27 was 22.4 g compared to 21.7 g for CB46 over eleven replicated field trials conducted in the San Joaquin Valley from 1995-1998. The black pigmented portion or 'eye' on the seedcoat does not 'leak' dark pigments during canning or cooking. Canning tests by S&W Foods, Modesto, CA and Michigan State University of grain grown in two California locations in 1996 and 1997 indicated this line has excellent canning quality.

Foundation Seed is being produced and will be available for production of Certified Seed in 2000. Consequently, Certified Seed of CB27 will be available to growers in 2001.

Table 1. Main Features of CB46 and UCR Entries in the 1999 Uniform Trial

	Resistance to:							
	Fusarium wilt		Root-knot nematodes					Seed weight in 1998
			M. incognita					
Entry	Race 3	Race 4	avirul.	virulent	*M. javanica*	Heat	Cut-out	
								g/100
CB27	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**23**
CB46	Yes	No	Yes	No	No	No	No	23
UCR 9802	Yes	Yes	Yes	No	No	No	No	23
UCR 9803	Yes	Yes	Yes	No	No	No	No	23
UCR 24-5	Yes	Yes	Yes	No	No	Yes	Yes	25
UCR 123	Yes	Yes	No	No	No	Yes	Yes	25

avirul. = avirulent, effectively controlled by gene *Rk*.
virulent = not effectively controlled by gene *Rk* alone.

Table 2. 1998 Uniform Trial Grain Yields of the Top Yielders

	Shafter	Tulare	Kearney	Riverside	Mean
	-----lb/ac-----				
CB27	5156	4967	4629	3113	4466
UCD 9259	5028	5208	4286	2861	4337
UCD 9823	3962	5388	5485	2447	4309
UCR 24	4442	5300	4601	2856	4289
UCD 9813	4994	5604	3837	2743	4278
CB 46	4732	5178	4268	2938	4271
UCD 9810	4420	5351	4007	3040	4191
UCR 9802	4468	5211	4383	2745	4190
UCR 123	4613	4823	4371	2960	4188
UCR 9803	4021	5428	4376	2862	4155
Mean	4496	5200	4330	2768	4186
LSD (0.05)	521	478	806	529	295
CV(%)	8	6	13	13	10
Planted-Cut*	**5/22-10/1**	**6/5-10/16**	**5/21-10/2**	**6/5-10/2**	

*Planting and cutting dates in 1998.

UPLAND COTTON VARIETAL RESPONSE TO SHORT-SEASON VERSUS LONG-SEASON MANAGEMENT PRACTICES

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1998 was a year which brought many changes in the variety situation in the CA cotton industry. Many of the management recommendations currently in place for CA Upland cotton are based upon years of research on varieties such as SJ-2, GC-510 and Maxxa. The introduction of some potentially widely-different varieties which were developed in environments outside of CA in most cases represents a real challenge in terms of identifying the most suitable management practices for best results under SJV conditions. These "newly-available" varieties that will come into CA will have the name designation "CA Upland" (official designation given by the San Joaquin Valley Cotton Board) to distinguish them from the "SJV Acala" designation given to the Upland varieties that come out of the "approved variety" program of the Board.

Some of these varieties have been grown on an experimental basis by seed companies in agronomic trials prior to 1998, so there is some general knowledge on preferred management practices that has been accumulated by the seed companies. Some of the varieties likely to be available in 1999 and beyond were also grown on a range of field-scale locations on grower fields in 1998, although these were generally in very late plantings (May 15 to June 10). Data from a year with such late plantings will be useful, but is not representative of the true range of crop responses likely under what will hopefully be a more typical year in 1999 and the next couple of years after 1999.

1999 Field Tests at Shafter REC and West Side REC. Trials initiated in 1999 at the West Side and Shafter REC's begin to look at the impact of combinations of two planting dates (mid-April versus early May), two irrigation treatments and two growth regulator regimes on growth, yield and quality responses of three cotton varieties (one approved SJV Acala (Maxxa) and two CA Upland varieties (Germains GC-204 (early-mid-maturity) and DPL Nucotton 33B (mid-maturity)). These varieties represent at least some of the range in expected differences in growth habit and estimated maturity across the CA Upland varieties when compared with an Acala standard.

Goals of the testing program will be to evaluate the growth characteristics, earliness, seedcotton yield, turnout, and lint quality characteristics of specific, representative varieties of Upland cotton under irrigation and growth regulator management practices designed to impact the duration of the fruiting cycle and length of growing season.

Some of these varieties can be classified as having the potential to be "early-maturing", "medium season", or "full-season" varieties. While years like 1998 can demonstrate the utility of "short-season" varieties in making a good crop within the constraints of a limited growing season, there are many years in CA where the growing season duration is much greater than in 1998. We feel that it is important to identify the "plasticity" of some varieties representative of part of the range of growth habits, maturity classes under management practices covering a range of strategies, including:

(a) conditions typical of a shorter growing season requiring a more compressed fruiting period (perhaps more water stress and earlier or higher rates of growth regulator)

(b) long-season management where goals may be to build a larger framework / more fruiting sites, with a different management scheme involving less water stress / more growth regulator application which are started later, and, if boll load warrants, consideration of additional foliar fertilizer applications during flowering to "push" the plant to take advantage of a long growing season

(c) with two planting dates, two irrigation/fertilizer regimes and two growth regulator treatments and the eight combinations (2 x 2 x2), there can be a range of conditions in between the extremes mentioned in (a) and (b) above

Basic plot layout will be four-row plots, with a length of about 85 feet (allowing three plots per 280 ft plot length, with a 20 foot alley in between), with three replications. Data collected in each plot will include lint and seed yield and quality characteristics. Six pound seedcotton samples will be collected in each plot, ginned at the Shafter REC, and analyzed for quality characteristics of each variety. Final plant mapping will be done on select varieties and treatments (as resources allow).

The crop management protocols (irrigation, ground preparation and cultural practices) will otherwise be typical of the WSREC operations for cotton. Shafter personnel and Kern County UCCE staff will be assisting at planting time and in separating out varieties and planters for the proper assignment to plots.

These varieties likely to come into the SJV largely represent an opportunity of unknown proportions to CA cotton growers. Tests on grower fields in 1998 were largely planted very late under the governor's emergency exemption, so may or may not truly represent the potential of these varieties in improving grower profitability. It is vital that we get some UCCE testing programs underway in 1999 and beyond that will begin to answer some questions regarding management approaches with these varieties. Information is needed by the growers to make some hard decisions on variety choices. It is important that at least some of these tests occur under well-controlled conditions so that assessments can be made of the likely range of varietal performance in both yield and quality characteristics. Varietal evaluations important to the growers and industry include not only yield, but performance, since quality characteristics of the new variety choices will impact both the reputation of CA SJV cotton and potentially the impact of the premium price now paid to growers of "Approved Acala" varieties approved by the San Joaquin Valley Cotton Board. Data from this project will eventually be described in the CA Cotton Review, and will also be mentioned in crop advisory updates printed in handouts at Production meetings.

SHAFTER RESEARCH EXTENSION CENTER
1999 APPROVED RESEARCH PROJECTS

NUMBER	LEADER	TITLE
31	Lyle Carter	Evaluation of the Efficacy & Establishment of Introduced Natural Enemies for the Biological Control of the Cotton Aphid in the San Joaquin Valley - Citrus, Melons
32	Lyle Carter	Cotton Stalk Management
32C	Lyle Carter	Machinery Concept Development & Testing
34	Steve Maas	Remote Sensing of Water Stress in Cotton
34A	Steve Maas	Remote Sensing of Insect Infestations in Cotton
37A	Bob Hutmacher	SJV Acala Approved Variety Trials
37B	Bob Hutmacher	Approved Pima Varieties
38	Ron Vargas	Cotton Weed Management - Transgenic Herbicide Tolerant Cotton Varieties
39	Bob Hutmacher	Establishing Updated Guidelines for Nitrogen Fertility
40	Dick Bassett	Cotton Varietal Evaluation in the San Joaquin Valley
42	Jay Rosenheim	Ecology of Generalist Predators in the Cotton Ecosystem
43	Larry Godfrey	Management of Key Cotton Arthropod Pest with Insecticides and Acaricides
44	Larry Godfrey	Factors Influencing Management of Cotton Aphids with Insecticides: Effects of Environmental & Agronomic Factors
45	Bob Hutmacher	California Upland Cotton Variety Evaluation
46	Bob Hutmacher	Cotton Varietal Response to Short-Season versus Long -Season Management Practices
47	Brian Marsh	Effect of Planting Date and Variety Maturity on Cotton Growth and Yield
51	Pete Goodell	Root-Knot Nematode Management
83	Anthony E. Hall	Development of High Yielding, Pest Resistant Blackeye Bean Varieties
84	Ron Voss	Potato Late Blight Management
85	Lyle Carter	Lygus Pheromone Attraction in Alfalfa
98-100	Lyle Carter	Aphid Parasite and Pathogen Evaluation
98-101	Lyle Carter	Caged Lygus Pheromone Attraction Evaluation

SHAFTER RESEARCH & EXTENSION CENTER

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MAIN STATION

1999
FIELD MAP
UNIVERSITY OF CALIFORNIA
SHAFTER RESEARCH AND
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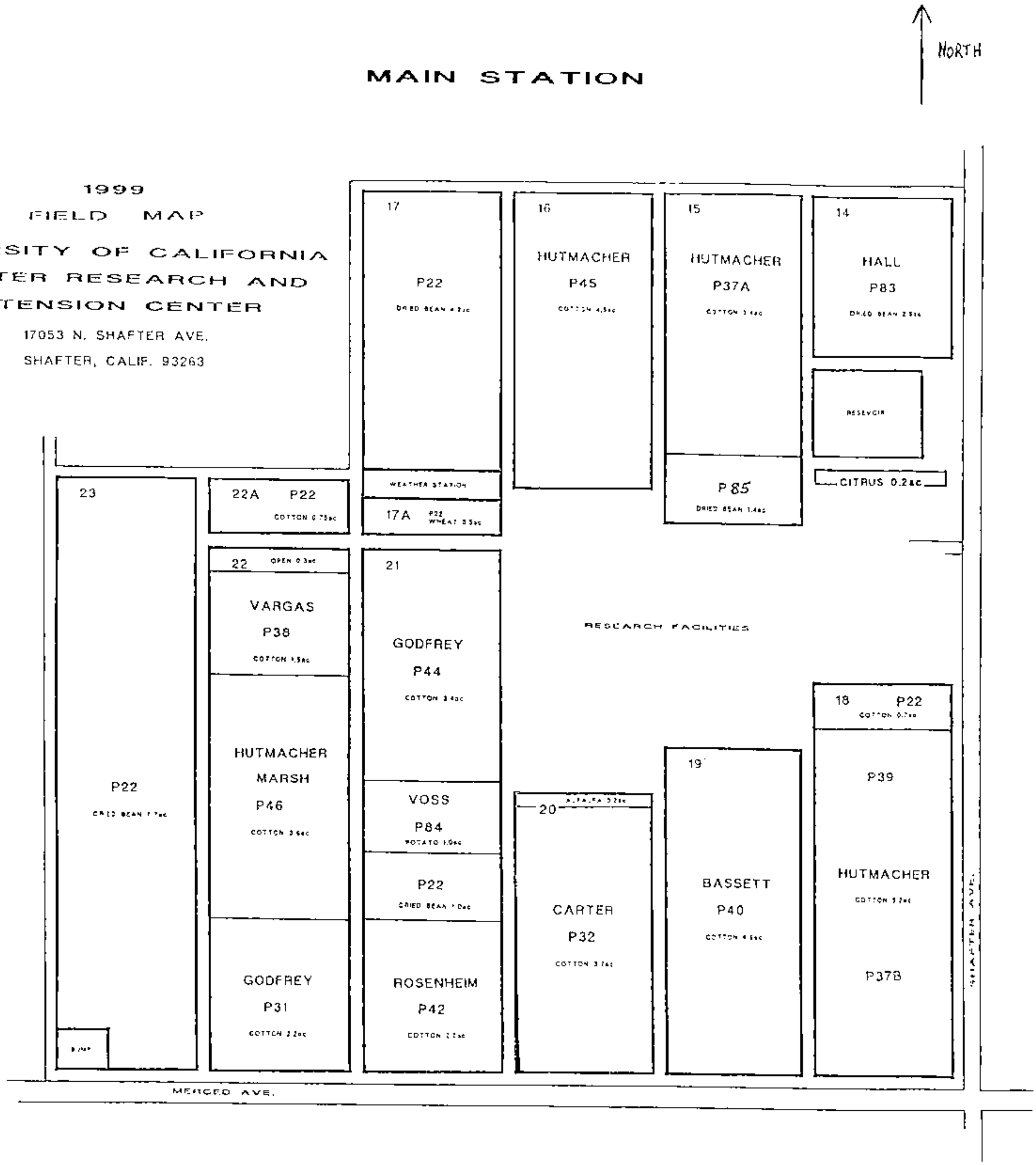
17053 N. SHAFTER AVE.
SHAFTER, CALIF. 93263



1999

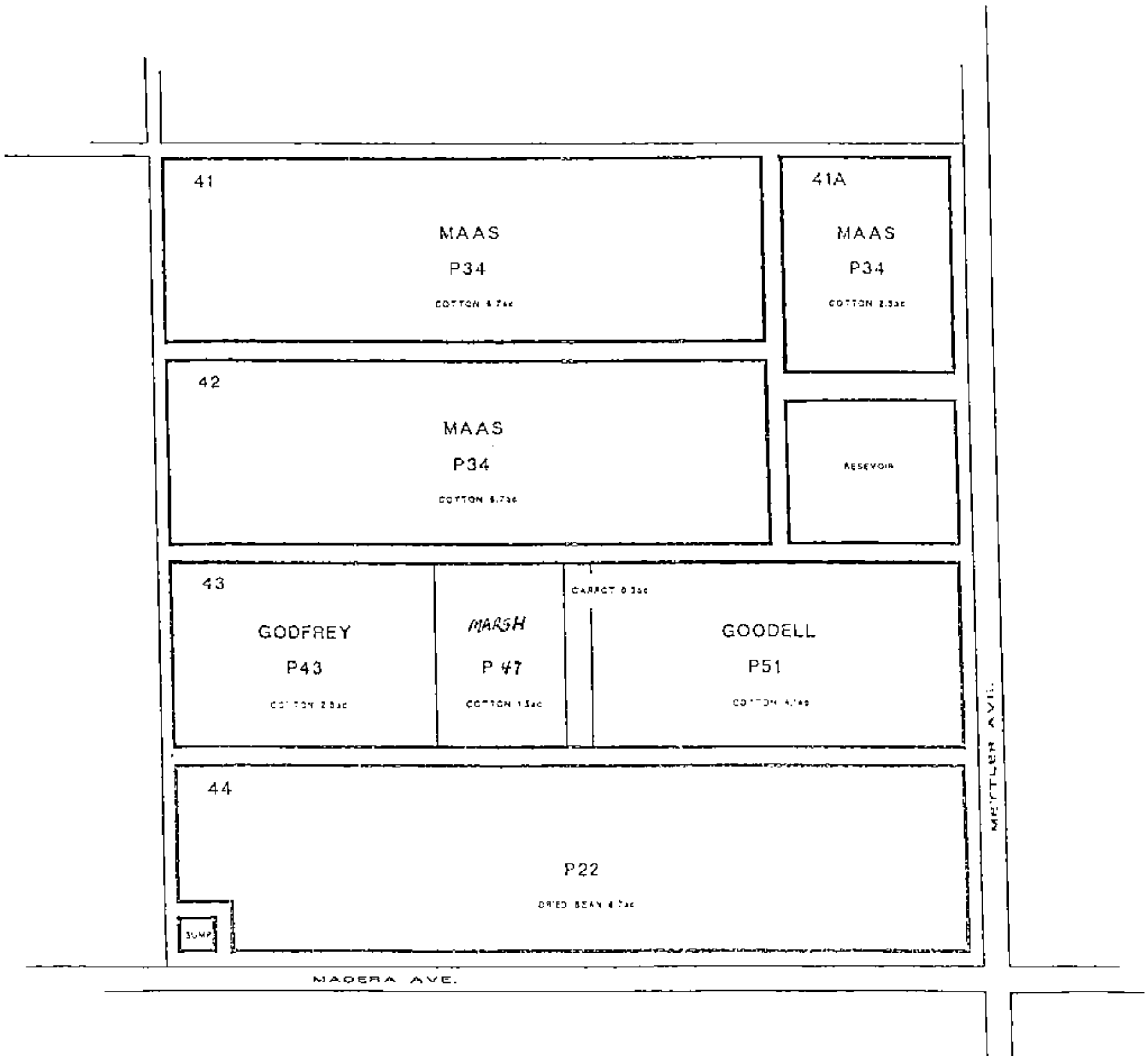
FIELD MAP

UNIVERSITY OF CALIFORNIA
SHAFTER RESEARCH AND
EXTENSION CENTER

17053 N. SHAFTER AVE.
SHAFTER, CALIF. 93263

NORTH

SOUTH 40



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