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Introduction

The ITMF's International Committee on Cotton Testing Methods is comprised of five working groups: High Volume Instrument Testing; Fiber Length; Dust and Trash; Maturity; and Honeydew. The Working Groups meet every two years before the International Cotton Conference in Bremen to review the progress of the work done in their respective fields of cotton testing methods. This issue of *THE ICAC RECORDER* contains a report on the last meetings of the working groups held March 10-11, 1992, in Bremen, Germany.

The meeting observed that the use of HVI systems is increasing worldwide and now 47 countries of the world have 545 systems capable of measuring at least micronaire, length, length uniformity, color and strength. Reproducibility is better than with laboratory equipment, but it needs to be improved particularly in strength and elongation measurements. A Task Force on HVI Strength was constituted to look into the sources and components of variation encountered in data for strength and its remedy.

In the field of fiber length it was reported that the tests conducted on three cottons measuring 27.78 mm, 28.58 mm and 34.51 mm maintained a difference of 1.00 mm as observed in the previous years. The issue of short fiber content was also discussed, and it was realized that a definitive measurement of short fiber content was still to be found and agreed upon.

The Shirley Trash Separator, the MTM Tester and the ITV Dust and Trash Tester were recommended by the Working Group on Dust and Trash to measure the amount of trash in raw cotton. It was observed that the video scanning trashmeters have potential to be used in HVI lines for measurement of trash content. Identification and categorization of trash type will continue to be a future area of work in the field of measuring non-lint content.

The Working Group on Maturity noted the progress of Near Reflectance and Advanced Fiber Information Systems to measure maturity. The results of the round trials continue to show an unacceptable wide range of differences in interlaboratory readings. It was decided that methods should be developed to measure the range of maturity values of a given sample and to predict undyeable white specks.

In the field of honeydew it was noted that there is an urgent need to develop an efficient and less expensive method of measuring stickiness in cotton. Reports were presented on new chemical and mechanical methods to replace the Minicard. The expanded use of the IRCT Thermodetector was noted.

Work is in progress to improve the repeatability of HVI strength measurements. The USDA has explored the possibility of using the module average instead of individual bale data. The studies undertaken on about 6% of the total bales in the US during 1991/92 have shown that module averaging improves the interlaboratory sustainability of the strength readings. The results of these studies have been discussed in an article on "Module Averaging to Improve Repeatability of HVI Strength Measurement."

The second article is on the "Success Story of 1991/92 US Cotton Crop," in which the important factors responsible for producing the largest crop since 1937 have been discussed. It was not only a bigger crop in size, but the quality of the crop set new records.

In the ITM Honeydew Working Group meeting in Bremen, five papers were presented on new methods to measure stickiness in cotton. According to the ITMF survey the problem of stickiness in cotton is on the increase and is of concern to cotton consumers. Considering the importance of the issue, particularly in the consuming countries, the papers presented at the meeting of the Honeydew Working Group were compiled and published by the ICAC secretariat for wider circulation of the new techniques to test cotton for stickiness. This publication was sent in April 1992 to *THE ICAC RECORDER* mailing list.

The date and place of the International Cotton Research Conference, to be held in Australia have been finalized. The conference will be held at St. Lucia Campus of the University of Queensland, Brisbane, Australia from February 14-17, 1994. The conference will be followed by optional field trips to cotton research facilities in Australia. The conference is sponsored by the International Cotton Advisory Committee, with the assistance of the Australian Cotton Research and Development Corporation. More information on the conference is given in a brochure. For more details contact Dr. M. Rafiq Chaudhry, Head Technical Information Section of the ICAC or Mr. Ralph Schulze, Executive Director, Australian Cotton Research and Devel-

opment Corporation, P. O. Box 282, Narrabri NSW 2390, Australia, Telephone (67) 924088, Fax (67) 924400.

Update on Cotton Testing Methods

The International Textile Manufacturers Federation established the International Committee on Cotton Testing Methods in 1979 with the objective to select and recommend uniform cotton testing methods among the cotton producing and consuming countries. It is anticipated that the new testing methods will be reviewed periodically and more accurate and efficient methods will be recommended for adoption. The main functions of the International Committee on Cotton Testing Methods are as follows:

- To identify rapid, practical and cost-effective cotton fiber test methods which can be recommended for use by the cotton trade and cotton industry worldwide
- To insure harmonization of test results between laboratories by standardization of procedures and round testing
- To promote discussion of the practical limitations to current testing in order to stimulate the necessary basis for research work which is required to overcome these limitations

The Committee has been able to accomplish its objectives through its five Working Groups. The Working Groups and their present chairmen are as follows:

Working Group

Chairman

HVI	Dr. Lawrance Hunter CSIR, Division of Textile Technology Port Elizabeth, South Africa
Fiber Length	Dr. Helmuth Harig Faserinstitut Bremen Bremen, Germany
Dust and Trash	Mr. Geoffrey Wilde Ralli Brothers & Coney Liverpool, United Kingdom
Maturity	Dr. Devron P. Thibodeaux USDA-ARS, Southern Regional Research Center New Orleans, Louisiana, USA
Honeydew	Dr. Henry H. Perkins, Jr. USDA-ARS, Cotton Quality Research Station Clemson, South Carolina, USA

Dr. Anton Schenek, Fachhochschule Reutlingen, Reutlingen, Germany is the overall chairman of the ITMF's International Committee on Cotton Testing Methods. The Committee, which has provided a forum to discuss matters of international concern in the field of testing cotton, is comprised of scientists and technologists from 21 cotton producing and consuming countries in addition to ICAC. The Committee has been meeting every two years before the International Cotton Conferences in Bremen, Germany. The last meetings of the working groups were held in Bremen on March 10-11, 1992. It was the first meeting for members from Australia, Czechoslovakia and China (Taiwan). It was also the first time that representatives from the instrument manufacturers had the opportunity to take part in the discussions and present the results of their test instruments. The Committee has a membership of 60 specialists, which with the addition of new countries and instrument manufacturers may rise to 70. Each expert is a member of one or more specific working groups depending upon his interest and expertise.

In the last meeting, which was attended by 57 members, the working groups met together for the two days, but the chairmanship changed with the working group. Dr. Anton Schenck introduced the new members and in

his opening remarks urged the members to participate actively in the deliberations, so that ITMF could benefit from their knowledge in the respective fields.

Working Group on High Volume Instrument Testing

The meeting on High Volume Instruments (HVI) was chaired by Dr. Lawrance Hunter. In total 20 papers were presented on the accuracy of HVI measurements, HVI calibration, calibration cottons and reproducibility of HVI data. Dr. Hunter in his report as chairman of the group informed members that in the last two years HVI Working Group Interlaboratory Round Trials have been conducted on uniform, homogeneous cotton by the Bremen Fiber Institute. The results show that the means and interlaboratory variation of the HVI Working Group members were similar to those of the other laboratories which participated in the round trials. The differences in the Bremen Round Trials using HVI and international calibration cottons were not consistent and of no practical significance. The USDA and the Bremen Round Trials involving HVI and laboratory instruments

showed that interlaboratory variation is lower for the HVI system than for laboratory instruments. He said that the interlaboratory coefficient of variation was within the acceptable limit of below 5% for micronaire, length (UHML and 2.5% span length), length uniformity and maturity. He said that, from the available data, it appears that improvements in the interlaboratory variability of strength, color (+b) and elongation were necessary.

In the meeting it was observed that the requirement for HVI calibration cottons has increased from 272 kgs in 1981 to 20, 235 kgs in 1991. This is in addition to international calibration cottons of 4,403 kg in 1991. It was noted that the HVI calibration cottons are available in sufficient quantities and continue to be available both in raw and saw ginned form (not carded).

Mr. Thomas Schneider, Chairman of the German HVI Working Group, presented a report on activities and recommendations from his group. He proposed that calibration for the strength measurement should be independent from the HVI. He also proposed that the basic instrument for the measurement of bundle strength should be the stelometer.

Dr. Preston Sasser, Cotton Incorporated, USA, who spoke about various methods of checking the repeatability of HVI data, remarked that more uniform samples improve the repeatability of almost all HVI measurements. He observed that in the US the laboratory-to-laboratory repeatability for strength was improved from 51% to 71% by assigning the module average to the bale at the classing office, and running a double HVI test at the quality control section. He, however, concluded that the techniques that increase the number of tests per bale will increase the laboratory-to-laboratory reproducibility of HVI data. Later Dr. Moon W. Suh from North Carolina State University, USA, presented the theoretical basis of computing reproducibility with and without the module average.

Many speakers noted that sample conditioning with the proper humidity and temperature has a great impact on the accuracy of the results.

The presentation of papers was followed by indepth discussions on each subject. The chairman of the HVI Working Group drafted a summary of the points agreed upon in the HVI Working Group meeting, as follows:

1. The introduction and application of HVI systems continues to grow world-wide, there now being HVI systems in some 47 countries, with a total of 545 systems capable of measuring at least micronaire, length, length uniformity, strength and color.
2. Interlaboratory reproducibility is generally better for HVI systems than for laboratory instruments (e.g. Stelometer, Pressley, Fibrograph and Micronaire meter) as shown in both the Bremen and USDA International Round Trials.
3. Improvement in strength reproducibility and calibration are required, and the need for an "automatic" universal strength calibration (reference) test is recognized. Work is in progress to achieve this result, but should be expedited. Close collaborative work between workers in the Bremen Fiber Institute and those in the USDA should help. A standardized micronaire correction formula for HVI strength is essential. Narrower tolerances for "material amount" could reduce strength variability.

4. There are no advantages to be gained from using carded cotton as opposed to cotton lint as HVI calibration cottons, except in the case of micronaire.
5. Certain working group members feel very strongly that stelometer strength and other information, presently available on International Calibration Cotton Standard samples, should also be provided for HVI calibration cottons. This aspect, together with the involvement of the Bremen Fiber Institute in the preparation of HVI calibration cottons, should be explored by the special HVI Strength Task Force and the USDA. The sources and components of HVI strength variation need to be identified and quantified. A significant operator effect present in stelometer tests was again pointed out.
6. Over 100 bales (25,000 kg) of calibration cottons are being consumed annually, presenting real problems for the USDA to provide the requested laboratory instrument values for all such cotton.
7. The use of carded calibration cottons for calibration of HVI micronaire is preferred, and these cottons will continue to be supplied by the USDA.

8. Module or trailer averaging system generally leads to improved strength repeatability. This method should also apply to other HVI measured properties, but it needs to be confirmed. Increasing the number of tests per bale will also increase reproducibility.

9. Accuracy and reproducibility of HVI elongation results are still problematic, but the introduction of jaw displacement transducers on the latest HVI systems, together with the use of calibration cottons for elongation, appears to hold considerable promise.

10. Improvements in HVI trash measurement, including information on the type (and cleanability) of trash, are still required, although more consistent calibration techniques have been introduced.

11. Accurate control of specimen moisture content at the instant of testing, or else the monitoring thereof and appropriate correction, is very important, particularly for strength and elongation.

12. Contamination of HVI jaws by a build-up of cotton wax could produce anomalous strength results.

13. Possible changes in the color of cotton with time, particularly in the case of immature cotton with relatively high levels of reducing sugars, need to be kept in mind.
14. Standardization of hardware, software, calibration cottons, levels and procedures and testing procedures (including specimen sampling and preparation) are absolutely essential.
15. Regular participation in round trials is considered essential for improved interlaboratory reproducibility.
16. Adequate operator training is important.
17. Concern was expressed that there is not a one to one relationship between Classer's staple length values and HVI length results, particularly for cottons longer than 1-1/4 inches (31.4 mm).
18. Although an HVI measure of short fiber content derived from the fibrogram is available, further work is necessary to evaluate and improve its accuracy.

19. It is highly likely that, beginning with the 1993 US cotton crop, the major components of grade, viz. color and leaf, will be separated, but this development will not require any change in the Universal Grade Standards for American upland cotton, except that certain descriptive standards, viz. gray, light gray and plus grades will be eliminated, and the Averaging Rule would no longer be required.

20. Built-in intelligent and comprehensive software systems for checking HVI hardware functions, calibration, testing procedures, levels and operator errors, should be provided by HVI instrument manufacturers. The algorithms used in the systems should be made available to users of the equipment.

21. Because of the importance of HVI strength results and the problems associated with calibration and reproducibility, a special HVI Strength Task Force, under the leadership of Dr. Helmuth Harig and functioning as part of the HVI Working Group, has been formed. This Task Force will address various HVI strength-related problem areas, some of which have been mentioned above.

Working Group on Fiber Length

The meeting was chaired by the outgoing chairman Mr. John M. Cuffan, Coats Industrial Technical, Paisley, UK. The responsibilities of the chairmanship have been passed to Dr. Helmuth Harig, Bremen Fiber Institute, Bremen, Germany.

The working group in the field of fiber length is more concerned in the identification of efficient and reliable methods to measure short fiber content. The main activities of the group, since its last meeting, have been round testing of new and more rapid length testers. Several studies all over the world have confirmed the importance of short fiber content in spinning, but there is still no satisfactory method to test the short fiber content. However, the most promising line of development appears to be the Advanced Fiber Information System (AFIS - L principle).

Motion Control Inc. is also working on HVI measurement of short fiber content. The technique is based on the principle that a tangent to the fibrogram with a .5 inch point will divide the vertical (fiber number) axis into the fractions of fiber shorter than .5 inch (above the tangent) and those longer

than .5 inch (below the tangent). Since HVI does not measure .2 inch near the base, it is assumed that there are no fibers shorter than .2 inch. Some of the data gathered by Motion Control Inc. from USDA-AMS Clemson, USA showed a high correlation coefficient of .94 between Suter-Webb and Motion Control HVI measurement for 14 standard sample cottons. It seems that the Motion Control HVI measurement for short fiber content has promise. The technique is still being evaluated by the USDA and Cotton Incorporated, USA.

Mr. P. Neelakantan from India presented his work on the development of a simple equation to predict the yarn strength at a given number of counts and twist multiplier from fiber properties like micronaire, upper half mean length, mean length, bundle strength at zero gauge and 2.5 mm gauge length. He also thought that if data on bundle strength at zero gauge also become available from HVI measurements, it will help to assess the strength of yarn from fiber properties.

The AFIS Length and Diameter (L&D) Information Module from Zellweger Uster has been tested in the round trials during 1991. The instrument uses electro-optical methods to measure the length of a large number of single

fibers from which length histograms and length statistics are produced. The round trial data, collected from 10 European laboratories during the course of 12 weeks, showed an average variation of less than 1.1% over the test period. The lowest and highest readings for short fiber content were within $\pm 2.7\%$ of the average values. The data from the US round trials for short fiber content varied by less than 1.2% over a period of 16 weeks.

The issue of redefining short fiber content (presently less than .5 inch) also came under discussion on the basis that fibers measuring less than 12.5 mm may be short fibers for one type of cotton but not for another. The idea was dropped due to the reason that defining short fiber content in relation to fiber length might result in an increase in disputes between buyers and sellers.

The chairman of the working group reported to the Bremen Cotton Conference that in the 1990 meeting the results of a round test to check comparability and reproducibility on the same cottons tested on HVI, Almeter and AFIS systems at seven test centers had shown a difference of 1 mm. The tests were repeated for 1992, but the repeatability did not improve. The

significance of this 1 mm reproducibility difference is a question which needs to be answered by spinners and machine manufacturers . He stated that a definitive measurement for short fiber content has still to be found. The chairman said that the discussions centered around the following questions:

- Is short fiber content an important measurement for the textile manufacturer?
- Can we technically measure short fiber content by HVI systems?
- What is the relative value of low vs. high short fiber content?
- What precision is required in the measurement of short fiber content?

He emphasized the importance of input from textile manufacturers and machinery manufacturers in finding Out acceptable answers to these questions. He said that there are no changes to the previously recommended parameters or reference methods for staple length and SFC measurements. The investigative work of the members of the working group will continue to solve the problems of definition and improved reproducibility.

A more precise definition as to what is the average length of a given sample or bale of cotton must be agreed. He wished his successor Dr. Helmuth Harig success in achieving these goals.

Working Group on Dust and Trash

The working group meeting was chaired by Mr. Geoffrey Wilde, and three papers were presented on the use of image processing for identification and categorization of non-lint material in cotton.

The work from Zellweger Uster reported on the comparison of MTM with TT 2000, MTM and ITV with Shirley Mark II, TT 2000 with MDTA 3 and MDTA 3 with AFIS- T. Compared with TT 2000, MTM cleaned to a greater extent, resulting in higher fiber damage and consequently a higher content of microdust and fiber fragments. TT 2000 also gave less variation on the measured values because of a shorter way through the measuring system. Comparing MTM, ITV and Shirley Mark II, a high correlation of 0.99 was obtained for trash but not for microdust and fiber fragments. Microdust and fiber fragments were out of the acceptable limits according to MTM and Shirley Mark II. The results showed that the newly developed MDTA 3 has

improved cleanability by 20-30% over TT 2000 and ITV-Tester, at the same time giving equally reliable results for trash, microdust and fiber fragments. MDTA 3 was also compared with AFIS-T which offers gravimetric determination of the amount of trash, but requires more time and a smaller sample size for testing. Cotton containing .5% to 5% trash was used, and it only achieved a correlation coefficient of .88.

The properties of yarn are influenced considerably by the reaction of fibers to opening and cleaning processes. Poor cleanability of cotton affects fiber qualities adversely, thus deteriorating the relationship between fiber qualities and yarn properties which are made from it. Dr. P. Artzt, Institut für Textil und Verfahrenstechnik, Germany presented a paper on "Quickspin Process" using the Uster MDTA which was originally marketed under the name ITV Tester. The yarn produced showed fairly clear quality differences in cotton from various areas. The influence of ginning and seed coat fragments could clearly be determined in addition to a high correlation between yarn tensile force values of a ring or rotor spun yarn and those of the Quickspin yarn.

It was observed that over a period of six years (1986 to 1991) the amount of non-lint content has decreased, but the size of particles has also decreased making it difficult to remove them during cleaning. The amount of seed coat fragments and neps has increased in general and in the same amount of time. It was emphasized that further work should be concentrated on the identification of definite particles of trash and the sources of variation. The ITMF committee chairman disclosed that the MTM Tester will no longer be available from the instrument manufacturer, while the ITV Dust and Trash Tester would be replaced by the MTDA 3 instrument, which is in principle the same. The chairman's report presented at the Bremen Cotton Conference is as follows:

At the meeting of the working group "Dust and Trash" in 1990, it was decided that the following instruments would be recommended.

- The Shirley Trash Separator
- The MTM Tester
- The ITV Dust and Trash Tester

They all have the capability of quantitatively analyzing both trash and dust in raw cotton and in cotton production, and remain acknowledged instruments in the industry.

Much work has gone on since the last Bremen Conference in the field of dust and trash. Improvements have been made to the standard recommended machines. New developments have also been seen coming along, such as video scanning trashmeters for use in HVI lines and mill production. Systems such as AFIS have also been evolved to analyze trash in a different way.

The committee noted the potential of these new developments and agreed to arrange a series of round trials in order to ascertain the suitability of each system. It is hoped that more detailed information will be reported by the next conference. When considering any kind of new development, the committee is always mindful that the tests should be scientifically based, rapid and cost effective and that the results should be meaningful and repeatable.

It was noted that while much work had been done in order to supply the spinner with testing equipment to help optimize mill machinery settings, much more was needed to help him select raw material. As to the cleanability of cotton, some kind of measure is required, preferably in the classing system. Identification and categorization of trash types is essential for neps, bark, grass and seed coat fragments and urgently required. Fabric quality is adversely affected by these troublesome defects. It was noted that work along these lines is progressing, and it is hoped that there will be something positive to report at the next meeting.

Working Group on Maturity

In the field of maturity, methods are available to measure the average maturity of cotton, but there is a need to explore instrumentation for evaluating the distribution of maturity. Lack of information on prevalence of immature and dead fibers causes serious defects in plain dyed fabrics. The appearance of defects emerging from immature and dead fiber neps may be in the form of nonuniform shading or hue of dyed fabrics and also as small undyeable white specks that usually show up in darker shades of cotton fabrics. The meeting of the Working Group on Maturity, which was chaired

by Dr. Devron P. Thibodeaux, discussed the performance of promising candidate test instruments to measure the distribution of single fiber fineness and maturity within a sample (AFIS Fineness & Maturity Option) and also the specific identification of material in a raw cotton sample from which the white specks originate (AFIS N module).

The Near Infrared Reflectance (NIR) technique can measure average maturity and has the potential to measure the amount of problematic dye resistant fibers in raw cotton. Prof S. Ghosh, Institute of Textile Technology, Charlottesville, USA discussed practical mill experience with NIR and showed positive ways in which it helped to control mixes to reduce dyeing problems.

Dr. Helmuth Harig reported on the round trials conducted during 1990/91 by the Bremen Fiber Institute, in which 35-37 laboratories participated. Maturity was tested by microscope, causticaire method, fibrograph and IIC Shirley F/MT methods, and in most of the cases a CV value of over 5% was recorded. According to Dr. Harig the sources of variation could be due to the sample preparation in Bremen, in the laboratories, conditioning of the samples, calibration of the instrument and the operator's experience in

running the test. Exact instrument service guidelines, with specifications on specimen preparation and conditioning, commitment to special calibration routines and availability of International Standards can help to improve the performance of round trials.

Mr. John Price, International Textile Research Center, Lubbock, USA reported on ways in which he has favorably used F/MT to help evaluate cotton breeding samples. F/MT helped reduce visible neps. Mr. Price did express concern about F/MT results being inconsistent for standard fineness values of the same variety planted at different locations.

Dr. Frederick M. Shofner from Zellweger Uster discussed recent instrument developments including the recalibration of the AFIS Nep module to allow prediction of shiny neps. He said that almost all cottons have some shiny neps, and those which survive appear as white specks on finished fabric. The dyebased visual ranking methods do characterize the shiny nep problem in the dyed fabric, but only qualitatively. The extensions to the "Tropical Map Maker," a device that collects fibers and neps as they exit the AFIS onto a moving web enables clear and quantitative counting of shiny neps per gram of dyed fiber. On the same principle, the AFIS

Neps module has been extended to quantitatively measure the shiny neps in undyed fiber. But the questions that still need to be addressed are what levels of shiny neps per square inch are acceptable and what size of shiny nep is negligible.

A newly formed Coalition, having members from Cotton Incorporated, USDA, International Textile Research Center, Zellweger Uster and West Point Pepperell, will help to develop methods which predict the amount of "white specks" that cause defect in the dyed fabric and determine a market-based acceptability levels of dye resistant neps.

Mr. Michael D. Watson, Cotton Incorporated, USA, discussed the nature of the white speck problem and the development of overall dyeing schemes aimed at rapid assessment of the problem in raw stock and dyed fabric.

The chairman 's report to the Bremen Cotton Conference concluded as follows:

Based upon the discussions of the working group, the objective as stated in 1990, "to foster the development of improved methods to assess the maturity of a sample of cotton fiber with the expected results of improved proc-

essing performance for the spinner and an improved marketing system giving greater incentives and correct signals to the cotton producers," was slightly changed by the modification of the phrase after "expected results," to "of improved spinning performance, reduced dyeing defects and an improved marketing system."

During the past two years the working group members have been active on several fronts. Reports were given on two rapid methods for measuring maturity, both of which have recently commercially available.

- The goals for the next two years are as follows:
- To continue to develop a satisfactory set of calibration cottons for standardizing all candidate instruments.
- To improve the variances experienced with the F/MT instruments during round trials.
- To continue work in the subgroup for specks to obtain further cooperation and input from expert groups and strive to develop an objective method for fabric dye defect assessment, no doubt based upon image analysis.

Working Group on Honeydew

The meeting was chaired by Dr. Henry H. Perkins and five papers were presented on new methods to estimate stickiness in cotton. Dr. Perkins on introducing the subject informed the group that the problem of stickiness is on the increase. The textile industry, with the advent of highly sophisticated machinery, is becoming more concerned about stickiness in cotton. He emphasized the need to develop a quicker method to test stickiness which could replace the minicard. He said that the method using NIR spectroscopy has the best potential for its implementation into the HVI system, if valid calibration methods could be developed. He also highlighted the role of breeders to develop varieties resistant to aphids and whitefly, which are the main source of stickiness in cotton.

Dr. Otto Elsner, Shenkar College of Textile Technology and Fashion, Israel, reported his experiences on the decoloration of sticky cotton over a period of time. His view was that if sticky cotton is stored for months at room temperature, depending upon the sugar contents it has, it changes its color to brown. He showed some samples and suggested the idea that

such a change could be used toward the estimation of sugar content in a given sample of cotton.

The chairman's report presented to the Bremen Cotton Conference also included a summary of the papers presented, they are as follows:

Stickiness caused by honeydew from aphids and whiteflies is a significant problem for cotton worldwide. There is a greater awareness of the problem today than ever before. Essentially every country that either produces or uses cotton is aware of the seriousness of the problem in relation to cotton marketability and use value. There is also a greater effort to control the problem today than ever before by implementing known technology to control insects or to treat contaminated cottons to minimize or eliminate stickiness in ginning and textile processing. Research is either underway or is planned in several different aspects of the problem to acquire the basic knowledge required for further development of technology to control or eliminate cotton stickiness.

The primary mission of the Honeydew Working Group is to develop test methods to rapidly measure sugar content and cotton stickiness both for

marketing purposes and for process control. However, an important secondary mission of the group is to encourage research on the overall problem of cotton stickiness and to keep abreast of new technology that may be developed either for insect control or for treating honeydew contaminated cottons.

No methods are available today either for measuring average sugar content or for detecting stickiness that are both fast enough and accurate enough to test cotton for marketing purposes. However, work continues on methods to measure reducing sugar content by use of NIR spectroscopy, and methods based on this principle have the potential for implementation into HVI systems. 'The physical methods for detecting stickiness such as the minicard, the Thermodetector, and the Shenkar tester will measure stickiness accurately, but they are too slow or too expensive for general use. However, they are used effectively by the cotton production and textile processing industries both for quality assessment and process control. Obviously, more research is needed on stickiness testers. The research effort today is greater than it was two years ago.

Reports on current research were presented by several group members.

Mr. S. Peles, Cotton Classing Institute, Israel, reported on the method used in Israel for determining cotton stickiness. The Folin test is used to determine the reducing sugar content of cotton. Cottons that have sugar content above a certain level are then tested by the minicard method. The final result is based on the combination of results of the two tests with greater emphasis given to the minicard results.

Dr. I-Shou Tsai, Graduate Institute of Textile Engineering, Taiwan, reported on a method for measuring the sugar content of cotton through the reaction of the water extract of cotton with an acidic solution of ammonium molybdate. The sugars act as reducing agents to convert the molybdic acid to molybdenum blue. The intensity of the developed color, determined spectrophotometrically, is proportional to the sugar content. This method actually detects "total" sugars, because it is conducted in hot acid solution which converts many complex sugars to reducing sugars that then react with the molybdic acid.

Mr. Eric Hequet and Mr. Serge Goebel, Institut de Recherches du Coton et des Textiles Exotiques, France, reported on new experiences with sticky cotton. The emphasis was on the type of yam defects that can result from

processing honeydew contaminated cottons. They also reported on the latest work to standardize results and speed up the thermodetector method for determining cotton stickiness. There are more than 50 thermodetectors now in use worldwide.

Dr. Herzl Bar-Yecheskel, Prof. A. Weinberg and Dr. Otto Elsner, Shenkar College of Textile Technology and Fashion, Israel, reported on their recent work with the Shenkar Stickiness Tester, Model SST-1. The tester has been remodeled to give both the number and size of sticky spots produced by a sample of 60-80 grams of cotton that is processed through a Kirschner type beater and between calendar rolls for up to 18 cycles. The sticky spots are counted and measured for size by a scanning device. Size distribution and total stickiness area are automatically determined by a computer.

Dr. Moshe Meron, Mr. Y. Tzipris and Mr. A. Ben Porath, MIGAL-Galilee Technological Center, Israel, reported on a new method for identification of honeydew spots on cotton by direct inspection. The cotton sample is made into a thin bat that is placed on a sheet of white, absorbent paper. Using heat and pressure, distinct caramel spots are transferred to the paper.

These caramel spots, caused by honeydew, are classified by number and size distribution using image analysis. Clean cottons and honeydew contaminated cottons are readily distinguished by the method.

Mr. Shigeaki Izawar, Toyobo Company Ltd., Japan, representing the Japan Spinners Association, sent a letter to the Honeydew Working Group, expressing the concern of Japan as a cotton consuming nation about the expanding problem of cotton stickiness on a worldwide basis. He specifically mentioned at least eight countries in which stickiness has occurred in the past several years. They asked that every effort be made to combat the sticky cotton problem on a worldwide basis.

The objectives of the Honeydew Working Group for the next two years are the following:

- To continue the work to develop test methods, both for measurement of sugar content and for detection of stickiness.
- To encourage efforts to control the insects that cause stickiness by implementation of integrated pest management practices.

- To standardize the procedure for conducting stickiness determination with the thermodetector and to carry out an International Round Trial Test to determine the between laboratory variation of the method based on results of the Round Test. Consideration will be given to using the thermodetector to replace the minicard as the reference method for determining cotton stickiness.

Success Story of 1991/92 US Cotton Crop

The world cotton production estimate for the year 1991/92 is placed at 21 million metric tons, which is 9.4% greater than the previous record set in 1984/85. The increase has come mainly from China (Mainland), USA and Pakistan. The final production figures from these countries are at 5.66 million metric tons, 3.84 million metric tons and 2.19 million metric tons respectively. It was the largest crop since 1984/85 in China, largest in the US since 1937/38 and a record in Pakistan. Despite an early freeze in Texas and wet conditions at planting in the Mid-South and Southeast, the USA produced its second largest crop in history. The factors that have contributed in producing such a bumper crop and the status of its quality are reviewed below.

Factors Responsible for High Production

Seed Quality

Seed is the most basic input, which not only ensures good plant establishment, but also restores farmers' confidence to invest in the crop. The open fall in 1990 and an increased focus on seed helped to provide high vigor seed to farmers. This high quality seed was successfully planted in California and Arizona where temperatures were favorable during the traditional planting period. In the Mid-South and Southeast, those who could get into the field, particularly the zero tillage farmers, benefitted from the high vigor seed. Adequate seed bed moisture favored vigorous seedling growth.

High Square Retention

While high temperatures induce pollen sterility and inhibit fertilization, mild temperatures enhance square/boll retention. Favorable conditions promoted squaring at early nodes during 1991/92. Square formation started at nodes 5 and 6 instead of 7, and these squares were retained due to conducive weather conditions. According to physiologists, if cotton plants enter

the blooming period with a high number of squares they are able to sustain growth and boll retention longer than plants that start out weakened due to stress. The 1991/92 season demonstrated the effect of a good start.

Boll Formation

The position of the bolls on the branches also matters. The bolls that are close to the main stem are always heavier and produce better quality seed as well as lint. Data from California show that during 1991 boll retention on the 1st position of the fruiting branches averaged 71 percent compared to 51 percent in normal years. While work done at California and Arkansas has shown that boll formation is sharply curtailed when the number of nodes above the white flower, on the apical shoot, drops to four or five, 1991 was an exception, with many states reporting bolls close to the top.

Low Post Pressure

The sowing of cotton was late in most of the cotton belt, which resulted in the suicidal emergence of pink bollworm during the spring. Pink bollworm is a major pest of Arizona, California and parts of Texas, which collectively produce about 50% of US cotton. Verticillium wilt was also reported to be

minimal, due perhaps to warm weather at the time of crop maturity in 1990. Spraying operations, due to the lack of rain, were also not disrupted.

Boll Maturation and Opening

The maximum temperatures remained below normal from planting through to June in most of the cotton growing areas, but certainly in those areas affected by high temperatures. These temperatures helped to check undesirable vegetative growth at an early stage. The data recorded at Shafter, California, show that degree day averages for April, May and June 1991 were only 66, 70 and 85 percent of normal. These mild temperatures contributed to the forming of bigger bolls due to only mild heat stress, which could have depleted carbohydrates at a fast rate. The degree days from July to October, with the exception of August, remained higher than normal, which helped boll maturation and opening. Due to a higher plant population, plant canopy and fruit position, conditions were very conducive for boll rot in the Southeast and Mid-South. Fortunately, the rains stopped shortly after boll opening started. Losses in yield due to boll rot remained as low as 5 percent, compared to previous highs of 20 percent.

Quality of 1991/92 US Cotton Crop

Plants with many bolls under longer sunshine hours of mild temperatures make best use of the inputs available. Low summer temperatures not only produce bigger bolls, but also enhance lint percentage and quality. These conditions led to the 1991/92 US cotton crop setting several records in quality.

Classing of 1991/92 Crop

According to Cotton Quality Reports from the USDA, up to April 6, 1992, 79.3% of classed cotton fell in white grades, and 20.8% in the light spotted and below grades, as against 75.5% and 24.5% respectively by April 1, 1991. In terms of grades more than 47% of the cotton was classed middling or better, while 27% was classed as strict low middling. The 1991/92 crop was the first crop which was totally classed by HVI.

Staple Length

In the US, it has been observed that in 10 years, staple length of the cotton crop has increased by an average of .79 mm. Average staple length

declined in 1990 and increased during 1991. The average staple length of 28.2 mm for 1991/92 crop will be a new high since such records were started in 1940. The excellent length of cotton from Arizona, Arkansas, Missouri, North Carolina and South Carolina contributed to the high national average.

Micronaire

The bolls formed at an early stage and maturing at high temperatures usually give a higher micronaire value thus affecting quality. The national crop average micronaire value for the year 1991/92 will be around 4.1, which is not a new record but certainly falls in the prime micronaire range.

Length Uniformity

Length uniformity has increased on average by .2% per year in the US. This is the fifth year that the USDA has reported length uniformity data. The national average uniformity index value for the 1991/92 crop will be close to 81.5%, which is the highest since the USDA started reporting the length uniformity data.

Strength

The strength of US cotton has increased since the HVI strength records were started in 1980; the annual increase in strength is .25 gm/tex. The national average value of 27.6 gm/tex for the crop year 1991/92 will be a new record. Arizona and Georgia have contributed significantly in enhancing the national average value of strength measured at 1/8 inch gauge in grams per tex.

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Module Averaging to Improve Repeatability of the HVI Strength Measurement

The use of High Volume Instrument (HVI) classification has provided valuable help to textile manufacturers in understanding the characteristics of lint quality and their utilization in making yarn and fabric. HVI offers much more efficient testing of important fiber qualities as compared to laboratory equipment. One of the checks to verify data is its reproducibility in another laboratory. Since the introduction of HVI machines, efforts have been made to improve the reproducibility of data recorded in one laboratory. Significant improvements have occurred in all the characters, including fiber strength. Still, the HVI recorded strength measurements are considered to be misleading, as the interlaboratory readings vary significantly.

Large variation in strength values create problems in textile mills, as many operations require precise measurement of strength. On the other hand, lack of repeatability of strength measurement is the area where HVI has received the most criticism. The Agricultural Marketing Service of the USDA

defines reproducibility as follows: "Retesting of a bale should fall within 1.5 grams per tex of its original strength determination." For example if the original classing of a bale was 27.0 grams per tex then the retest value should be within 25.5 to 28.5 grams per tex. The samples which deviate from the module average by 4.0 are called "outliers." An outlier needs to be retested, and experience shows that 95% of them give values close to the module average. The average repeatability on the basis of bale-to-bale HVI readings has remained about 68%, which is considered to be low and which needs to be improved.

In order to decrease the differences among readings, one of the options explored by the USDA is the use of module or trailer averages.

The module system was introduced in 1972, nonetheless not all the cotton in the US is stored in modules. In the last 20 years module storage has become more popular, although storing cotton with moisture more than 12% has usually affected grade and quality. In 1990 about 55% of cotton in the US was stored in modules, with 70-76% of the crop in California, Arizona and Texas.

It is assumed that all the bales within a module or trailer have the same true strength value and the variation observed is only due to the effect of such factors which can be minimized. The apparent sources of variation in bale-to-bale readings or laboratory-to-laboratory readings could be as follows:

- Bale strength may not be really the same. There may be differences which emerge from field conditions.
- Machine/instrument variation comes in if the HVI machine is not properly calibrated before starting the data recording.
- Variation due to the operator of the machine.
- Sample preparation and its conditioning is another source of variation. HVIs have shown to be very sensitive to fluctuations in atmospheric conditions which affect the sample. To this regard, relative humidity and the temperature of the sample to be run on an HVI machine are considered to be of prime importance.

Module averaging at least eliminates the variation coming from the operator, sample preparation and its conditioning.

In order to test the concept "module average truly represents the average value of all the bales in the module" controlled studies were initiated on a small scale by the USDA during 1990/91. However, the data were sufficient to support a pilot project during 1991/92.

A total of 99 gins from all over the cotton belt of the USA participated in the pilot project during 1991/92. Data from the gins totaled more than a million bales and accounted for about 6% of the total production in the US during 1991/92. Of the total bales, 600,215 bales came from modules and 441,373 bales came from trailers. The average number of bales per module was 12.5, and the average number of bales per trailer was 7.6.

The bales coming from module or trailer were flagged separately. A sample from each bale was tested and the strength measurements from all the bales within a module or trailer were averaged. Based on the mean value, standard deviations were calculated for all the bales coming either from the module or trailer. Any bale falling out 4.0 grams per tex of the average

value of the module or trailer was excluded from the averaging process. Outlier bales retained their own value.

Secondly, as a counter check, 1% of the samples were sent to the Quality Control Section for independent observation. In fact, three methods were used to calculate sustainability. Single Test, Double Test and Module Average. Single test sustainability was the comparison of a single test with that of the test reading recorded at the classing office. Double test sustainability was an average of the two readings, one at the classing office and second a retest reading of the same sample at the Quality Control office. Module average sustainability was calculated by comparing the module average assigned to the sample by the classing office to the average of two tests made on the sample at the Quality Control office.

Single test, double test and module average gave sustainability value of 55%, 62% and 71 % respectively. The module average value has a higher reproducibility of 29% over the single test, and 15% over the double test respectively. The average range of strength measurement between bales within modules was 3.71 grams per tex and 3.04 grams per tex in the bales within trailers. The within module and trailers standard deviations

were 1.17 and 1.19 respectively. Similar results were reported from Mississippi on a single gin basis, where reproducibility of the bales falling in the acceptable limits of 1.5 grams per tex was recorded at 62.7% and a module average at 71.3%.

Textile mills have the most to gain from increased reproducibility, but the other impacts of using the module average as a unit at the textile mill will have to be studied. The sources of variation which prevent repeating the same value need to be studied. The cotton sample taken from the same bale should measure within the tolerance limits of 1.5 grams per tex from one reading to the other if the variation coming from machine, operator and sample conditioning are eliminated or at least minimized.

The gins are undoubtedly the most important component of the module average concept. But, if the concept of the module average is commercialized, the farmers will have to pay for the increased logistics involved in computing the module average at the gins. Breedlove (1992) and Owen (1992), who presented their experiences as ginners at the 1992 Beltwide Cotton Conferences, observed that there are no economic gains in using the module average. It was observed that selling on the basis of a bale's in-

dividual identity could bring higher total income than selling on the basis of a module average.

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Report of the 2nd Consultation on the Interregional Cooperative Research Network on Cotton Mediterranean and Middle East Region

Thessaloniki, Greece, June 16-19, 1992

Introduction

The consultation was organized jointly by the FAO Regional Offices for Europe and the Near East in collaboration with the Cotton and Industrial Plants Research Institute, Sindos, Thessaloniki, of the National Agriculture Research Foundation of Greece. The meetings were held at the International Center Helexpo, Thessaloniki, on June 16 and 17 and at the Cotton and Industrial Plants Research Institute, Sindos, on June 18. A visit to a cotton field on June 19 was also a part of the consultation. The consultation was conducted in English, French and Greek on June 16; however, Greek translation was not available on the following days.

Participation

Thirty-three participants represented Algeria, Belgium, Bulgaria, Egypt, France, Iran, Israel, Morocco, Netherlands, Pakistan, Spain, Sudan, Syria and Turkey. A similar number of participants came from Greece. From FAO, Dr. Khairi Sgaier, Crop Production Officer of the Regional Office for the Near East and Dr. Hayati Olez, Assistant Regional Representative for Europe, attended the consultation. ICAC was represented as an observer by Dr. M. Rafiq Chaudhry, Head, Technical Information Section.

Dr. Urania Kechagia, Director, Cotton and Industrial Plants Research Institute, Sindos, was elected as Chairman of the Meeting. Dr. Ahmed El-Gohary (Egypt), Dr. Adolfo Borrero (Spain) and Dr. Oktay Gencer (Turkey) were elected as Vice Chairmen of the meeting. In two days, more than 35 papers and reports were presented. On June 18, after a visit to the Textile Technology Research Center of the Hellenic Cotton Board in Thessaloniki, discussions were held at the Cotton and Industrial Plants Research Institute, Sindos.

Review of the Network Activities

The last consultation was held in Montpellier, France from April 13-15, 1988. Dr. Michel Braud, Director of the IRCT had been elected Coordinator for a period of four years. Dr. Braud presented a progress report of the activities of the four working groups. The Working Group on Variety Trials started field trials in 1989. Bulgaria, Greece and Spain participated in the program but the same varieties were not tested in a specific trial in a particular year in all the countries. As a result no comparable data could be obtained. The same exercise continued during 1990, 1991 and 1992, but no other country volunteered to participate in the program. A meeting of the Working Group was held in Seville, Spain, in March 1991 but no improvement could be made in the layout of the trials. The available data show that the varieties performed best in their respective countries. On the basis of these results, Dr. Braud stated that the formation of a group on variety trials seems to be a mistake. He stated that the objective of variety trials in various countries needs to be reconsidered.

The Working Group on Growth Regulators started with the collection of data on use and status of research on growth regulators in the member

countries. On the basis of information thus compiled, an experiment was designed to test two chemicals. The results were discussed in the group meeting held in Athens at the end of the first year. However, the same research program continued as the group could not meet again due to lack of funds. Dr. Braud appreciated the efforts of the Chairman of the group to plan trials and organize a meeting of the participating countries.

Dr. Braud stated that no significant progress was made in the other groups. Although the Chairman of the Working Group on Technology circulated a questionnaire and also tried to initiate round trials in the member countries of the network, response was very poor.

Dr. Braud observed that the formation of Working Groups should be reconsidered. He pointed out that the possible reasons for slow progress are poor communication among the National Centers and members of the Working Groups; lack of funds at all levels; and dual responsibilities of the Coordinator (Coordinator of the network and Director of IRCT at the same time). He suggested that, in order to improve the effectiveness of the network, some funds should be placed at the disposal of the Coordinator; he

should be free of other responsibilities; the role of national institutes should be clearly defined; and the national leaders should play an active role.

International Cotton Research Group

Ms. Johanna Louwagie of the Laboratory de Meulemeester for Textile Technology, Gent, Belgium, made a brief presentation on the International Cotton Research Group being established at the University of Gent, Belgium. She said that the negotiations are underway and regulations being framed to initiate the activities of the group in 1992. She added that the proposed group has the support of the Belgium Government, and it will be an effective tool to fill the gap left by the International Institute for Cotton, which may be closed in 1993. According to Ms. Louwagie, the International Cotton Research Group will serve as a research organization as well as be a source of information on cotton.

Role of ICAC

Dr. Chaudhry of ICAC noted that the first Regional Meeting of Cotton Researchers in the Mediterranean and Middle East had been held in Greece

in 1984 under the auspices of the ICAC and the Hellenic Cotton Board and that the ICAC had been part of the organization of the 1988 meeting in Montpellier. He assured the representatives that ICAC stood ready to assist the network develop its potential. It was decided that the next consultation in 1996 will be organized in consultation with ICAC.

Dr. Chaudhry of ICAC also brought the new status of ICAC as an International Commodity Body to refer projects for funding to the Common Fund for Commodities and the International Cotton Research Conference to be held in Australia from February 13-17, 1994, to the attention of participants.

During the discussions on June 18, 1992, the representative of ICAC also made two proposals to facilitate communication and the use of cotton germplasm among the member countries. He proposed that a monthly or bimonthly newsletter be initiated to Working Group keep the people informed about the activities of the network. The newsletter could also be a source of information on important results and achievements made in the member countries. He proposed that an institute willing to accept the responsibility be designated for a period of four years and that all the national coordinators send their material to the designated institute. Under

the same conditions, another institute could be responsible for collecting commercial varieties of the member network countries, maintaining them and Supplying them on request. Dr. Olez of FAO objected to the proposals on the grounds that it is difficult to collect information and cotton germplasm from so many countries, given their limited cooperation.

Decisions

Discussions were held on June 18, 1992, on the functioning and restructuring of the network. It was admitted by almost all the speakers that the activities of the network have remained restricted due to financial difficulties and lack of communications. It was accepted that the working groups should be reconstituted to enhance the usefulness of the network.

On the financial issue, the delegates were reminded that it had been decided in the last meeting held in 1988 that, since the network activities were to be established within the scope of the national programs, no particular funds would be needed for such activities. It was clarified by Dr. Olez that only those persons and institutes should be selected as National Coordinators and National Centers respectively who are prepared to de-

fray the expenditures, from their own budgets, required to fulfill their responsibilities as National Coordinators for the network activities.

It was agreed by all the participating countries that the National Coordinators and Working Groups should be revised. The new working groups along with their chairmen are as follows:

Working Group	Chairman
Breeding	Greece (person to be decided later)
Variety Trial	Dr. Adolfo Borrero, Spain
Growth Regulators	Dr. Kiratso Kosmidou, Greece
Nutrition	Dr. Mohamed M. El-Fouly, Egypt
Water Management	Dr. Raza Hassani, Iran
Weed Control	Dr. Michel Deat, France
Integrated Pest Management	Dr. El Jadd, Morocco
Fiber Technology	Dr. Urania Kechagia, Greece
Biotechnology	Mrs. Christine Peeters, Belgium

The respective institutes of the National Coordinators will serve as National Centers. It was decided that if any working group is not functional for two years, the chairman of that working group will be changed. All countries, according to their needs and interest, are welcome to join any working group by contacting the respective chairman.

Dr. Michel Braud was once again selected as Coordinator of the network for a period of four years. He accepted the responsibilities and hoped that, since he is shortly retiring from the IRCT, he will be able to devote sufficient time to the network activities.

The delegate from Morocco offered to host the next meeting of the Interregional Cooperative Research Network on Cotton in Morocco in 1996. The offer was welcomed by the participants.

Report

Dr. Hayati Olez, Assistant Regional Representative for Europe, FAO Regional Office for Europe, will prepare the report.

Compilation of Papers

Dr. Urania Kichagia, Director, Cotton and Industrial Plants Research Institute, Sindos, Thessaloniki, Greece, offered to compile and publish all the papers presented at the meeting.

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Short Notes

- The boll weevil (*Anthonomus grandis*) is a notorious cotton pest which causes a huge but invisible loss to the crop, starting from the early squaring stage to the end of fruit formation. In the US, since its invasion from Mexico, millions of dollars have been spent on research to control this pest economically and with minimum threat to the natural fauna. Still it is an active pest of cotton in many growing states in the US, although it has been successfully eliminated from southeastern states. The control approach has generally remained restricted to cultural practices and organic insecticides. Lately, USDA-ARS entomologists have identified an "attract and kill" device called Boll Weevil Bait Stick which carries an attractant and an insecticide. The stick is 2.22 cm in diameter and 91.44 cm in length which is coated with a mixture of shellac, cotton seed oil, lime green pigment and an insecticide. On top of the stick is a plastic cap which contains sex pheromone to serve as attractant. The enticer encourages the weevil to feed on the stick surface containing the insecticide. The boll weevil is killed rapidly before it enters into a reproductive stage. The Boll Weevil Bait Stick, tried on 2000 hectares during 1991/92, has proved that

it can be used to kill over-wintered boll weevils. For effective control of the early emerging boll weevils, one to two sticks should be placed for every three hectares of cotton to be planted. Depending upon the insect population, 10 to 15 sticks should be placed per planted hectare at an early stage of the crop. The chemical is usually effective for a period of four to six weeks. Boll Weevil Bait Sticks will undergo extensive testing during 1992/93 and 1993/94. (Source: "Commercial Development of the Boll Weevil Bait Stick for Control of Over-Wintered Boll Weevils in Cotton." *Proceedings of the Beltwide Cotton Conferences*, 1992)

- The sweetpotato whitefly (*Bemisia tabaci*) is a cotton pest which multiplies at a fast rate under dry weather conditions. It sucks sap from plant leaves and is also responsible for the transmission of viral diseases like leaf curl in cotton. Under severe infestation conditions, the quality of cotton is also affected by sugary secretions of the nymphs. In the US during the fall of 1991, heavy attacks of whitefly were observed in the Southwest, which affected cotton, vegetable crops and fruit plants over a vast area. Cotton suffered economic losses in the Imperial Valley of California and the Rio Grande Valley of Texas. Whitefly is among these notorious pests which develop resistance against insecticides. In the US, a new biotype of the

insect is appearing which has shown resistance to chemicals currently on the market to control this insect. It has compelled farmers to increase the quantity of insecticides which still have some degree of efficacy against this pest and use them more frequently. In order to identify priority areas and accelerate its research activities, USDA is planning coordination of whitefly research on a national level. The current activities will be reviewed and new lines of action under a coordinated approach will be set. Biological control is being preferred which includes importation of predators, parasites and pathogens of sweetpotato whitefly from India, Pakistan and some Middle Eastern countries which are considered to be longer hosts of this insect. Efforts on the chemical front will also continue to explore such new insecticides which give effective control of the insect. In this regard the insecticides presently registered in other countries will also be tried. In the meantime, whitefly wasps were released by the USDA's Animal and Plant Health Inspection Service in early March of this year in the Rio Grande and Imperial Valleys to prevent a heavy pest attack. The wasp (*Eretmocerus mundus*) is microscopic in nature and its use is absolutely safe for other living organisms. It lays eggs in the whitefly larvae and kills the pest before it succeeds to produce another generation.

- The International Textile Manufacturers Federation has been undertaking surveys on contamination of cotton since 1983. From the survey conducted during 1991, it is observed that 85% of the surveyed cotton fall in the insignificant category (little contaminated), 11 % moderate and 4% serious. (highly contaminated) as against 86%, 9% and 5% respectively in 1989. From 22 countries included in the survey, most contaminated cotton originated from Brazil, Egypt, India, Pakistan, Sudan, and Turkey. Australia, Colombia, Guatemala Israel (Acala), Mexico, Paraguay, Peru, USA (Pima, California, Arizona, El Paso), Uzbekistan (medium staple) and Zimbabwe were included among the countries producing least contaminated cotton. The most serious source of contamination, taking all cottons together, was organic matter (leaves, feather, paper, and leather, etc.). In 1989, 30% of the cottons surveyed were marked as moderately or seriously contaminated with organic matter; this percentage decreased slightly to 28% in 1991. Fabrics and strings made of cotton, jute/hessian and woven plastic were another main source of contamination (12%). The biggest problem in the area of inorganic matter was caused by sand and dust (20%), oily substances and stamp color chemicals (15 %). The survey also showed that the problem of stickiness is on the increase. In 1991,

27% of the evaluations reported stickiness as against 21% in 1989. Sudan, with all the varieties marked as sticky, was the most affected country (75% to 90%) followed by Cameroon (65%), Chad (64%) and India (DCH variety 55%). Seed coat fragments were the source of contamination in cotton originating from Sudan, India, Pakistan, Turkey and a number of origins from the US (except Arizona). Cotton from Latin American countries and China (Mainland) was marked as least affected by honeydew and seed coat fragments. (Source: "Cotton Contamination: A Global View from the Spinning Industry." *Proceedings of the 21st International Cotton Conference*, Bremen, Germany, March 12-14, 1992)

A DIALOG Search from the Agricola Database on Quality Based Marketing Systems in Cotton

The DIALOG search relates to the papers published from 1980 to date on marketing of cotton based on quality. The key words used in search are **Cotton, Marketing and Quality.**

90085477 91054239 Holding Library: AGL

A new cotton quality evaluation and marketing system.

Parnell, C.B. Jr.;

Texas A&M University, College Station, TX

Proceedings : Beltwide Cotton Production Conference. 1989. p. 93-94.

Memphis, Tenn. :National Cotton Council. ISSN: 1052-5351

DNAL CALL NO: SB245.B42

Language: English

Meeting Held January 3-4, 1989, Nashville, Tennessee.

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76)

Document Type: Article

90085474 91054236 Holding Library: AGL

Cotton fiber quality and marketing -What are the reasons for change?

Deussen, H.;

American Schlafhorst Company, Charlotte, NC

Proceedings : Beltwide Cotton Production Conference. 1989. p. 85-88.

Memphis, Tenn.: National Cotton Council. ISSN: 1052-5351

DNAL CALL NO: SB245.B42

Language: English

Meeting held January 3-4, 1989, Nashville, Tennessee.

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article

89002661 89023981 Holding Library: AGL

Expansion continues: the Australian cotton industry defies weather, world prices and U.S. protectionist policies.

Schulze, R.;

Cotton International. 1989. (56th) p. 204, 206. maps.

Willoughby, Ohio: Meister Publishing Company. ISSN: 0070-0673

CODEN: CTTNA

DNAL CALL NO: 72.8 C8214I

Language: English

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article

89002658 89023978 Holding Library: AGL

Cotton on the upswing.

Longoria T. A.;

Cotton International. 1989. (56th) p. 198, 200.

Willoughby, Ohio: Meister Publishing Company. ISSN: 0070-0673

CODEN: CTTNA

DNAL CALL NO: 72.8 C82141

Language: English

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article

89002656 89023976 Holding Library: AGL

Cotton is benefitting from research.

Cotton International. 1989. (56th) p. 194-195.

Willoughby, Ohio: Meister Publishing Company. ISSN: 0070-0673

CODEN: CTTNA

DNAL CALL NO: 72.8 C82141

Language: English

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article

89002651 89023971 Holding Library: AGL

How to sell cotton at a high price.

Izawa, S.;

Cotton International. 1989. (56th) p. 176-180.

Willoughby, Ohio: Meister Publishing Company. ISSN: 0070-0673

CODEN: CTTNA

DNAL CALL NO: 72.8 C8214I

Language: English

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article

89002643 89023963 Holding Library: AGL

Advance planning for cotton exports is imperative.

Thakkar, C.D.;

Cotton International. 1989. (56th) p. 142-143.

Willoughby, Ohio: Meister Publishing Company. ISSN: 0070-0673

CODEN: CTTNA

DNAL CALL NO: 72.8 C8214I

Language: English

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article

89002636 89023956 Holding Library: AGL

Rendezvous with Europe in 1992.

Kassarian, G.D.;

Cotton International. 1989. (56th) p. 126-127.
Willoughby, Ohio: Meister Publishing Company. ISSN: 0070-0673
CODEN: CTTNA
DNAL CALL NO: 72.8 C8214I
Language: English
Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);
Document Type: Article

89002629 89023949 Holding Library: AGL

A magnificent scope of possibilities.

Bote, A.J.W.;

Cotton International. 1989. (56th) p. 78, 80.
Willoughby, Ohio: Meister Publishing Company. ISSN: 0070-0673
CODER: CTTNA
DNAL CALL NO: 72.8 C8214I
Language: English
Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);
Document Type: Article

89002628 89023948 Holding Library: AGL

Supplying a growing Pima market.

Curlee, J.;

Cotton International. 1989. (56th) p. 76.

Willoughby, Ohio: Meister Publishing Company. ISSN: 0070-0673
CODEN: CTTNA
DNAL CALL NO: 72.8 C8214I
Language: English
Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);
Document Type: Article

89002616 89023936 Holding Library: AGL

Does the need for finer, stronger, cleaner cotton require a new marketing system?

Deussen, H.; Weuhaus, L.

Cotton International. 1989. (56th) p. 26, 28, 30, 32.

Willoughby, Ohio: Meister Publishing Company. ISSN: 0070-0673
CODEN: CTTNA
DNAL CALL NO: 72.8 C8214I
Language: English
Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);
Document Type: Article

89002615 89023935 Holding library: AGL

A new era of cotton evaluation.

Curran, J.M.;

Cotton International. 1989. (56th) p. 22, 24.

Willoughby, Ohio: Meister Publishing Company. ISSN: 0070-0673

CODEN: CTTNA

DNAL CALL NO: 72.8 C8214I

Language: English

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article

88129253 89008764 Holding Library: AGL

Production quality and vertical integration in the early cotton textile industry.

Temin, P.;

The Journal of Economic History. Dec 1988. v. 48 (4) p. 891-907.

New York, N.Y.: Cambridge University Press. ISSN: 0022-0507

DNAL CALL NO: 277.8 J922

Language: English

Includes references.

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article

88107942 88037537 Holding Library: AGL

Historical review of cotton quality and price discount/premiums for the Mississippi Delta region.

Herndon, C.W. Jr.;

Proceedings : Beltwide Cotton Production Research Conferences. 1988. p. 467-469.

Memphis, Tenn. : National Cotton Council and The Cotton Foundation.

CODEN: BCOPB

DNAL CALL NO: SB249.N6

Language: English

Conference held on January 3-8, 1988, New Orleans, Louisiana.

Includes references.

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article

87093445 87047469 Holding Library: AGL

Ginning-management practices and systems for improved fiber quality.

Mayfield, W.D.; Lalor, W.F.

Proceedings : Beltwide Cotton Production Conference. 1987. p. 118-120.

Memphis: National Cotton Council.

DNAL CALL NO: SB245.B42

Language: English

Includes references.

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article

87093443 87047467 Holding Library: AGL

Research priorities for the genetic and agronomic improvement of cotton quality.

Miller, P.A.;

Proceedings : Beltwide Cotton Production Conference, 1987. p. 113-115.

Memphis : National Cotton Council.

DNAL CALL NO: SB 245.B42

Language: English

Includes references

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article

87093439 87047463 Holding Library: AGL

Why the textile industry needs improved cotton quality - the textile manufacturer's viewpoint.

Barnhardt, R.A.;

Proceedings : Beltwide Cotton Production Conference. 1987. p. 104-105.

Memphis : National Cotton Council.

DNAL CALL NO: SB245.B42

Language: English

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article

87093438 87047462 Holding Library: AGL

Why the U.S. textile industry needs improved cotton quality.

Kimbrell, W.D.;

Proceedings : Beltwide Cotton Production Conference. 1987. p. 103-104.

Memphis : National Cotton Council.

DNAL CALL NO: SB245.B42

Language: English

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article

87093424 87047448 Holding Library: AGL

New textile processing and technology and its impact on fiber quality needs.

Deussen, H.;

Proceedings : Beltwide Cotton Production Conference. 1987. p. 47-53.

Memphis : National Cotton Council.

DNAL CALL NO: SB245.B42

Language: English

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article

87093423 87047447 Holding Library: AGL

Marketing pricing based on fiber properties.

Ethridge, D.E.;

Proceedings : Beltwide Cotton Production Conference. 1987. p. 44-46.

Memphis : National Cotton Council.

DNAL CALL NO: SB245.B42

Language: English

Includes references.

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);
Document Type: Article

87091515 87044882 Holding Library: AGL

Prices paid by textile manufacturers for cotton fiber properties.

Bowman, K.R.; Ethridge, D.E.

Proceedings : Beltwide Cotton Production Research Conferences. 1987. p. 446-448.
Memphis, Tenn. : National Cotton Council and The Cotton Foundation.

CODEN: BCOPB

DNAL CALL NO: SB249.N6

Language: English

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76)
Document Type: Article

87086181 87041791 Holding Library: AGL

Taking a bigger share.

Ali, S.A.;

Cotton. International edition. 1987. (54th) p. 169-171.

Memphis : [s.n.]. ISSN: 0070-0673 CODEN: CTTNA

DNAL CALL NO: 72.8 C8214I

Language: English

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);
Document Type: Article

87075380 87030384 Holding Library: AGL

How cotton meets future market demands with quick response.

Morton, G.P.;

ACPTC Proceedings: Combined Central, Eastern, and Western Regional Meetings.
1986. p. 41-44.

Monument, Co. : The Association of College Professors of Textiles and Clothing.

DNAL CALL NO: TS1300.A36

Language: English

Subfile: OTHER US

Document Type: Article

87002539 86066642 Holding Library: AGL

Reviving the industry.

Kleveland, A.;

Cotton. International edition. 1986. p. 244-246.

Memphis : [s.n.]. ISSN: 0070-0673 CODEN: CTTNA

DNAL CALL NO: 72.8 C8214I

Language: English

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article

87002534 86066637 Holding Library: AGL

Quality is imperative.

Pulvermacher, A.;
Cotton. International edition. 1986. p. 221, 247.
Memphis : [s.n.]. ISSN: 0060-0673 CODEN: CTTNA
DNAL CALL NO: 72.8 C8214I
Language: English
Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);
Document Type: Article

87002531 86066634 Holding Library: AGL

Egyptian cotton is still a major source of foreign currencies.

Dawoud, M.;
Cotton. International edition. 1986. p. 196, 198.
Memphis : [s.n.]. ISSN: 0070-0673 CODEN: CTTNA
DNAL CALL NO: 72.8 C8214I
Language: English
Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);
Document Type: Article

87002528 86066631 Holding Library: AGL

Economy revolves around cotton.

Husain, A.;
Cotton. International edition. 1986. p. 182-184.
Memphis : [s.n.]. ISSN: 0070-0673 CODEN: CTTNA

DNAL CALL NO: 72.8 C8214I

Language: English

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article

87002521 86066624 Holding Library: AGL

Made in Greece from Greek cotton.

Kyriazis, B.;

Cotton. International edition. 1986. p. 138-139.

Memphis : [s.n.]. ISSN: 0060-0673 CODEN: CTTNA

DNAL CALL NO: 72.8 C8214I

Language: English

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article

87002519 86066622 Holding Library: AGL

Cotton -a product of transformation.

Berselli, G.M.;

Cotton. International edition. 1986. p. 126-129. ill.

Memphis : [s.n.]. ISSN: 0070-0673 CODEN: CTTNA

DNAL CALL NO: 72.8 C8214I

Language: English

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article

87002510 86066613 Holding Library: AGL

Stressing high strength, low micronaire may require a rethinking of breeding and marketing methods.

Deussen, H.;

Cotton. International edition. 1986. p. 32, 34, 36.

Memphis : [s.n.]. ISSN: 0070-0673 CODEN: CTTNA

DNAL CALL NO: 72.8 C8214I

Language: English

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article

87002414 86066397 Holding Library: AGL

U.S. cotton must be world's quality cotton to succeed in competitive market.

The Cotton Gin and Oil Mill Press. Aug 2, 1986. v. 87 (16) p. 18-19.

Mesquite, Tex. : Houghton Publishing Co. ISSN: 0010-9800 CODEN: CTGPA

DNAL CALL NO: 304.8 C822

Language: English

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article

86146413 86061981 Holding Library: AGL

Cotton quality in relation to merchandising.

Scheidt, R.E.;

Proceedings : Beltwide Cotton Production Conference. 1986. p. 76-77.

Memphis : National Cotton Council.

DNAL CALL NO: SB245.B42

Language: English

Paper presented at the "Beltwide Cotton Production Conference," January 4-9, 1986, Las Vegas, Nevada.

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article.

86073157 86926541 Holding Library: AGL

Cottonseed grade-weather relationships and grade prediction.

Hudson, J.F.; Stewart, R.

Proceedings : Beltwide Cotton Production Research Conferences.

Jan 4-8, 1981. p. 224-226.

Memphis, Tenn. : National Cotton Council and The Cotton Foundation.

CODEN: BCOPB

DNAL CALL NO: SB249.N6

Language: English

Proceedings: Beltwide Cotton Production Research Conferences in New Orleans, Louisiana, Jan 4-8, 1981.

Includes 4 references.

Subfile: AGE (EG ECON USA); OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76;
Document Type: Article

85137916 85925288

Market integration: an application to international trade in cotton.

Monke, E., Petzel, T.

American Journal of Agricultural Economics. Nov 1984. v. 66 (4) p. 481-487.

Ames, Iowa : American Agricultural Economics Association. ISSN: 0002-9092

DNAL CALL NO: 280.8 J822

Language: English

Includes 12 references.

Subfile: AGE (AG ECON USA); OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76;
Document Type: Article

85123782 85002651 Holding Library: AGL

Relation between price-quality and demand for cotton.

Relacao preco-qualidade e procura de algodao em pluma

Nogueira Junior, S.;

Agricultura em Sao Paulo. 1981. v. 28 (1/2) p. 81-106.

Sao Paulo : Divisao de Economia Rural. Departamento da Producao Vegetal.

DNAL CALL NO: 9.2 AG823

Language: Portuguese

Includes 28 references.

Subfile: OTHER FOREIGN;
Document Type: Article

85091784 84925149 Holding Library: AGL

The role of staple length in the international market for cotton.

Monke, E.A.; Petzel, T.

Technical Bulletin - Arizona Agricultural Experiment Station.

June 1983. (248), June 1983. 36 p.

Tucson : The Station. ISSN: 0097-6962

NAL: 100 AR4 (2)

Language: English

Includes 8 references.

Subfile: AGE (AG ECON USA); EXP STN (STATE EXPER. STN);

Document Type: Article

84064058 83922272 Holding Library: AGL

Hedonic price estimation for commodities: an application to cotton.

Ethridge, D.E.; Davis, B.

Western Journal of Agricultural Economics. v. 7 (2), Dec 1982. p. 293-300.

College Station, Tex. : Western Agricultural Economics Association.

Local Call No: HD1750.W4

Language: English

Includes 25 references.

Subfile: AGE (AG ECON USA); OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article

83002140 82920400 Holding Library: AGL

Synopsis of working conference on cotton fiber quality issues, April 7-8, 1981

Ethridge, M.D.;

MP - Texas Agricultural Experiment Station. Jan 1982. (1505), Jan 1982. 13 p. College Station, Tex., The Station.

Local Call No: 100 T31M

Language: English

Subfile: AGE (AG ECON USA); EXP STN (STATE EXPER. STN);

Document Type: Article

81048236 80102694 Holding Library: AGL

Turkish cotton's better quality impact market.

Ince, I.; Sekitmez, O.

Cotton. International edition. v. 47, 1980. p. 102, 104. ill.

Memphis, Tenn., Meister. ISSN: 0070-0673

NAL: 72.8 C8214I

Language: English

Subfile: OTHER US (NOT EXP STN, EXT, USDA; SINCE 12/76);

Document Type: Article