X:\ENGLISH\RECORDER\89\MARCH

*Where X = the drive letter of the CD-ROM

march1	Introduction
march2	Report on African Regional Cotton Research Conference
march3	Evolution of Crop Protection Programs in West Africa
march4	The Use of Day-Degrees in Cotton Production
march5	Major Weeds in Cotton
march6	Insecticide Resistance in Columbia
march7	Short Notes
march8	A Dialog Search from the Agricola Database on Weed Science

Introduction

This first 1989 issue of the *ICAC Recorder* contains a brief report on the recently held African Cotton Research Conference in Lomé, Togo. ICAC served as a cosponsor of this seminar. Both English and French speaking researchers participated. We continue to work to improve the exchange of experience in cotton research on the African Continent, especially crossing the language barriers.

Further articles in this issue deal with the evolution of insecticide spraying programs in West Africa (also based on the above mentioned conference), the concept and use of day-degrees in cotton production and the development of insecticide resistance in Colombia.

A detailed reading of the background document to ICAC's 1987 Technical Seminar resulted in the identification of ten major weeds in cotton. Our findings are summarized in a brief report and some research on control methods for morningglory, one of the most important weeds, is presented. Also, our literature survey focuses on weed science as we present the latest entries on this subject in both the *Agricola* and *Agris* database.

The Technical Information Section is currently preparing a comprehensive survey on cotton production practices which will be published for the next ICAC Plenary Meeting which will be held in Arizona, USA from October 1-6, 1989. The objective of the survey is to obtain a database on production practices which will systemize and computerize our present knowledge on this subject. By updating this set of data on a continuous basis we hope to be able to signalize important trends leading to increased productivity in cotton production.

The following documents are available at the Secretariat: *Quality Control in the Cotton Product, Survey of the Cost of Production of Raw Cotton, Cotton Production by Type,* and *Solving the Problem of Cotton Contamination*. There will be a charge of $25 per document. Payments should be made by check drawn on a U.S. domestic bank properly coded with the Federal Reserve routing and transit numbers, or by money transfer to McLachlen National Bank for deposit on account 145-031-0.

Report on African Regional Cotton Research Conference

An African Cotton Research Conference was held from January 31 to February 2, 1989 in Lomé, Togo. The initiative to organize the conference was taken by the Institut de Recherches du Coton et des Textiles Exotiques (IRCT), the France-based cotton research institute active in French-speaking Africa since the late 1940's.

The meeting was hosted by the Ministry of Rural Development of the Republic of Togo. The conference was sponsored by the French Ministries of Development Cooperation and Foreign Affairs, the Food and Agricultural Organization of the United Nations, the Centre Technique de Coopération Agricole et Rurale, Wageningen, the Netherlands, and the International Cotton Advisory Committee.

The conference should be seen in the perspective of the economic difficulties these countries presently have to produce cotton at a profit. Farmers' fixed buying prices combined with an elaborate production and marketing

system result in the cotton production companies not making any profits at the present world market price levels. Donor agencies, such as the World Bank, are heavily involved in cotton production projects and are pressing those responsible for cotton production to make budget cuts.

In total, there were 220 participants from 20 African countries and some non-African countries. Both cotton researchers and representatives from cotton development companies and projects, as well as representatives of private companies, mainly agricultural input suppliers, attended the meetings. The conference was organized in three sequential sessions so that each participant could in principle attend all the presentations. The three sessions were devoted to variety improvements and fiber technology, agronomy and extension, and crop protection. In total, more than 50 papers were submitted which were summarized at the start of each session. a document with abstracts of all papers in both English and French is available at the Secretariat.

The main objective of the variety improvement program in the Francophone Zone for the coming few years will be to enhance fiber quality. Previously, the main focus of the breeding program in the area has been to in-

crease ginning percentages. However with the release of the variety ISA 205, used in Côte d'Ivoire and to some extent in Mali and Burkina Faso, the ginning percentage is believed to have reached a maximum level of 43 percent. Strength, maturity and uniformity are the traits sought in the new breeding programs. It is very likely that in the near future only three varieties will be cultivated in the area: ISA 205 in Côte d'Ivoire, Mali and Burkina Faso; F264 in Togo and Benin; and IRMA 1243 in Cameroon and Chad.

Various papers focussed on the development of glandless cotton. So far, these varieties have not been grown commercially despite their potential to provide a high protein flour, edible oil an a quality of lint not below that of the presently produced cottons. Technically, producing the glandless varieties on a large scale poses not problems, but commercially there are substantial risks as some investments have to be made to produce flour and oil, and it is by no means clear what the size of the market will be. As cotton meal is a new product, market penetration might be slow and major promotional efforts are necessary. Donor agencies were called upon to assist countries realize the potential of glandless cotton.

In a new development, breeders in Togo and Côte d'Ivoire are trying to incorporate a gene originating from a wild cotton species (*Gossypium australe*) in the commercial cultivars aiming to obtain a plant with glands in the vegetative parts but glandless in the reproductive parts of the plant. In this way the plant might benefit from the gossypol-containing glands early in the season providing protection against insects, while the seeds will be glandless. This work is still in an initial phase.

In the agronomy sessions much attention was devoted to the problem of weeds. In most areas weeding is still done by hand, and the operation is considered a major constraint in the farming system as it takes many labor days and limits further expansion of the cultivated area. The use of herbicides can alleviate these problems, but their use adds to production costs, and not all farmers possess the necessary skills to apply them. However, the experience of Côte d'Ivoire has shown the feasibility of herbicide application both technically and economically. It was stressed that a farming system approach to the weed problem is imperative, as weed control only in cotton, without appropriate control in sorghum, maize or groundnuts, may create more problems especially with the selective broad-leaf weeds.

Other papers presented strategies to go from nationwide agronomic recommendations to a regionalized approach. In Togo, an economic survey has led to a classification of villages in three types depending on the land availability, population pressure and level of technology. This classification will be used by the extension service to tailor general recommendations to the needs of the specific region. Also, simple methods to diagnose problems at the farm level have been developed.

The main preoccupation in the entomology sessions was to come to a more efficient spraying program than the presently used prefixed calendar spraying programs. Several methods using a combination of calendar spraying and threshold spraying are being evaluated. The main constraint is the lack of skilled insect scouts and entomologists to supervise them. With most cotton development companies now operating at a deficit, the pressure is to reduce insecticide applications. The challenge is to reduce spraying costs but at the same time to assure sufficient levels of protection with a spraying strategy which is operational, given the human and technical resources of the country. In a separate article in this issue of the *ICAC Recorder*, some of the propositions are discussed.

In 1982 a new strain of bacterial blight which has overcome the resistance built in the presently cultivated varieties was identified. The disease is presently spreading out and has reached a considerable number of countries. The breeding programs have not yet succeeded in producing resistant cultivars against this new strain, and strict application of sound farm practices, such as the burning of stalks immediately after harvesting, is the only remedy available at this point.

Parallel to the conference, several meetings were held among national coordinators of the cotton research programs. These discussions were held at the invitation of the French Ministry of Development Cooperation which, being part of CORAF (Conférence des Responsables de la Recherche Agricole Africaine et Coopération Internationale en Recherche Agronomique pour le Développement), sponsors regional research networks in Francophone Africa on rice, maize and some other commodities. Representatives of the Anglophone countries were invited as observers to these meetings. An agreement was reached to submit a formal project proposal to the next CORAF-meeting to create a network for cotton research in the area. This network is *de facto* in place as IRCT, involved in cotton research in virtually all the Francophone countries, is already assuming the

role of scientific counselor and coordinator in the area. However with the financial backing of CORAF, cooperative research projects or other costly initiatives might be realized. The highest priority of the first elected coordinator, Mr. E. Koto of Côte d'Ivoire, is to get the network operational. In a second phase, as the wish was expressed by the founding members, the structure would be open to all the non-Francophone countries on the African Continent.

Evolution of Crop Protection Programs in West Africa

Many French speaking West African countries are confronted with a cotton production sector which at the present world cotton price levels is hardly profitable. While it is recognized that cotton development companies are often engaged in widespread regional development activities, trimming production costs is one way to reduce current cotton deficits.

It is evident that an important cost category such as the cost of the plant protection program is under scrutiny, and entomologists are studying possibilities to reduce costs while at the same time assuring an adequate level of protection without increasing the risk of field failures and resistance buildup.

The crop protection division of IRCT, which collaborates closely with several national cotton research institutes, has developed several cost reduction strategies which are now under experiment. At the recent African Cotton Research Conference, Mr. Jean Cauguil, director of IRCT's crop pro-

tection division, presented four possible scenarios which could lead to important savings in protection costs.

Presently, all the crop protection programs in French West Africa are based on systematic calendar spraying. The active ingredients are mostly pyrethroids and some organophosphates, in most cases sprayed in mixtures. A typical spraying program consists of six sprayings at intervals of 15 days starting about 45 days after planting. This program has proved to be efficient if adapted to the local situation. So far, there have been no signs of resistance against pyrethroids in the African Continent, however, on the island of Madagascar resistance has developed in *Spodophera littoralis* against pyrethroids, and studies indicate also that organophosphates become less efficient to protect the crop against this insect.

To reduce the costs of prefixed calendar spraying, four possible approaches are proposed. First, reducing the number of applications. This can be achieved by delaying the first application until an economic threshold is reached. If that is the case, and the program of fixed interval spraying is delayed, it may be possible to eliminate one or two sprayings at the end of the season.

A second alternative is to reduce the number of active ingredients in the fixed calendar sprayings to one and, then, apply the second ingredient only at high levels of infestation. Depending on the region one could opt to spray pyrethroids at a fixed calendar and to add organophosphates only when, for instance, aphids or whitefly populations reach certain thresholds. Also the inverse is possible: fixed calendar spraying of organophosphates complemented with threshold spraying of pyrethroids in case of high boll-worm infestation.

Third, doses could be reduced. One strategy would be to apply a base program of fixed calendar spraying using only half the original doses. This base program could be complemented at any point in time with additional spraying of again 50 percent of the original dose when the situation required it. Another proposal would be to double the number of sprayings but to use only one third of the original dose. It is recognized that both approaches have the imminent danger of inefficiency or even accelerated buildup of resistance, and these issues should be closely monitored, especially as farmers in the region generally already underspray. Experiments in Chad and Cameroon have shown the potential of this strategy.

Lastly, true threshold spraying, as applied in some developed countries could be used. It was concluded that a series of problems presently inhibit the effective introduction of such a program in West Africa: the number of insect species of importance in the region is high, which makes definition of threshold levels rather complex; finding operational criteria to base the threshold on; the perception by farmers and extension workers of a program based on frequent monitoring (increased work-load) and sampling (yield reduction); the necessary delay in the process of monitoring, reporting and action; and the reliability of scouts. In view of these problems, it is not expected that threshold spraying in the strict sense would be a feasible technology in the near future. However, several compromises are under consideration such as using monitoring to readjust spraying intervals and even to skip sprayings as the season progresses. Experiments in Zambia have been successful using this approach.

In Côte d'Ivoire an extensive experiment was conducted over the last few years, comparing several of the above described methods at the experiment station and in an outreach program. Interestingly, true threshold spraying led to an increase in the number of sprayings not necessarily compensated by actual increases in yields. Mr. G. Ochou, reporting on the

experiment, revealed that yield effects of any method did not seem to be consistent over seasons, being either somewhat negative or slightly positive. Cost consideration and long term effects will probably be decisive factors in weighing alternative strategies.

The Use of Day-Degrees in Cotton Production

The concept of day-degrees as a measure of crop development is still a well-established practice in both crop research and production. From the relative straightforward summary of average daily temperatures above a threshold level to its more sophisticated use in crop simulation models, like *Siratac* (Australia) and *Gossym* (USA), the concept has proven its value. As a proxy to evaluate the intensity of those biological activities dependent on temperature, the accumulation of average temperatures can fairly accurately predict the duration of the various development stages in the cotton plant.

However, as with every scientific model, the use of day-degrees in crop simulation is only an approximation of reality and, thus, has its limitations. Moreover, some processes in the "biological factory" constituted by a developing cotton crop are less dependent on temperature and, consequently, the concept of day-degrees has very little value. In two recent arti-

cles in *the Australian Cotton Grower and Coton et Fibres Tropicales,* the concept and use of day-degrees in cotton production is discussed.

In his article titled "The Use and Abuse of Day-Degrees," Brian Hearn, of CSIRO, points out that it is incorrect to state that cotton has a day-degree requirement for the season as a whole. The cotton plant, however, does need a certain quantity of heat units to complete some well-defined stages in its development, like sowing-emergence, emergence-first bud, first bud-first flower and first flower-first open boll. But the length of the period of boll filling until termination, according to Hearn, is less dependent on temperature, as termination occurs when the boll load reaches the carrying capacity of the plant, which is more dependent on factors such as water stress, nutrient availability, pest attacks and shedding rate.

Hearn makes a distinction between development and growth. Development is defined as the life cycle of the plant consisting of various phenological stages. Growth is merely the increase in size and weight of the plant. Parallel to this distinction we have to separate boll maturity, which is development, from boll filling, which is growth. The latter is largely dependent on solar radiation while the former is a temperature driven process. If

the boll maturing process is finished while still insufficient boll filling took place (because of e.g. cloudy weather), the end result can be immature fibers and low micronaire values.

But even when using accumulated heat units to predict the development of the cotton plant some precautions have to be taken. For instance, the effect of "extreme,, temperatures outside the range of 15-35°C is not clear, and it cannot be assumed that development continues to relate to temperature in a strict linear way. Also, it is noted that factors like water stress and nutrient availability may have a depressing influence on development as well.

In summary, Hearn concludes that the tool of day-degree monitoring has its most appropriate use in "predicting or explaining the occurrence of events or duration of stages in crop development." Secondly, a day-degree analysis can provide a base-case picture of the life cycle of the crop. Deviations from the base-case can be analyzed case by case revealing other determining factors than temperature, which then might be modified by the producer. Thirdly, total accumulated heat units for the season is one

indicator which can contribute to a comprehensive evaluation of the season or to land suitability studies.

An example of the practical use of heat units is presented in the IPM manual for the Western Region of the USA. Farmers are advised to keep track of heat units throughout the season. Thresholds have been calculated for the different production valleys in the region. The pest management strategy takes account of the heat units by considering them as an environmental factor.

Another example for the same area is provided by Kerby *et al.* In experiments on emergence rate they found that apart from the quality of the seeds, emergence rates were dependent on the accumulated heat units during the first five and ten days after sowing. Consequently, they now recommend farmers to sow only when the weather forecast indicates a minimum of eight heat units in the next five days.

The difficulty in interpreting heat unit-based forecasts under atypical conditions was evident in the 1988/89 season in the USA. In a contribution to *Cotton Grower* magazine, Jack Mauney, plant physiologist, states that the

early season drought did complicate the analysis of plant development. Firstly, the cool temperatures very early in the season in the Mississippi Delta slowed down plant growth and development so that the effect of water stress caused by drought later on was less severe. However, as the plant experiences water stress, leaf temperature goes up especially under unfavorable humidity conditions. The hypothesis is put forward that at these high leaf temperatures, the photosynthesis process becomes less efficient and the high temperatures become a negative factor for plant development and growth.

In a multiyear experiment in Montpellier, France, M. Cognee, plant physiologist of IRCT, has tried to establish a correct formula for heat unit accumulation for the Mediterranean production zone. The Bulgarian short-season variety, Pavlikeni 73, was used. Sowing at least at three different dates in every season over a five year period (1981-1985), a multitude of formulas were tried to establish the relation between temperature and plant development. Roughly, the applied formulas could be separated in "direct" arithmetic methods and methods based on regression analysis.

The "direct" methods used were the "traditional" methods using the average of daily maximum and minimum temperatures with a threshold minimum, the triangulation method using instant temperature values rather than point values such as maxima and minima, and a "half way" method using weighed averages of day and night average temperatures. Threshold levels in these methods were determined by the "Arnold," which consists of a trial and error method in which the correct threshold is the one which gives the lowest coefficient of variance obtained after calculating accumulated heat units for one specific stage of development.

Several regression formulas were tried out to calculate total required heat units for each stage in development, ranging from simple linear regression to exponential and quadratic equations. Both, the sum of the daily temperatures and the average temperature during a stage were used as independent variables to explain the duration of that stage.

Among the "direct" methods, the "traditional" gave good results especially in explaining the duration of the stages until first flowering. Threshold temperatures for this method were 12°C to 13°C, depending on the stage. The linear and exponential regression methods did not yield better results than

the simple traditional method. A quadratic equation gave the best results in terms of R^2. Interestingly, optimum temperatures calculated from the quadratic curves were situated between 20°C and 23°C only. However, when used to predict the duration of each stage since its beginning, the formula proved less accurate. Also, the number of observations (21) to estimate a quadratic equation was rather limited.

In conclusion, Cognee states that in the case of the Mediterranean Zone, the best method remains the "traditional" one using daily minima and maxima with a threshold temperature. This method could, fairly well, predict the duration of the initial stages of development until flowering. The poor results to predict any later stages with any of the formulae used might be attributed to location conditions such as cool weather and shorter days later in the season. In the Montpellier area no commercial cotton production is possible due to climatic factors.

Sources:

Hearn, B., "Use and Abuse of Day Degrees," *Australian Cotton Grower,* Volume 9, No. 6,1989.

IPM for Cotton in the Western Region of the U.S., University of California, AAMR, publication 3305,1985.

Kirby, T. A., Keeley, M., Johnson, S., "Cotton Field Emergence Based Upon Seed Quality and Heat Units," *Proceedings of the Beltwide Cotton Production Research Conference,* 1987.

Mauney, J., "How to Use Heat Unit Models In a Dry Year," *Cotton Grower,* Volume 24, No. 8,1988.

Cognee, M., "Température et Développement en Culture Cotonnière Méditerranéenne," *Coton et Fibres Tropicales,* Vol. 43, No. 2,1988

Major Weeds in Cotton Cultivation

As part of the background material collected for the 46th Plenary Meeting of ICAC in Brussels, producing countries were asked about the major weeds in cotton. From these contributions, a list of more than 130 weeds can be drawn representing data for thirteen countries. Some countries provided information up to the level of the genus, while others gave names of species within each genus. In total, the 130 species represented about 85 genera.

Importance of each weed in geographical terms for each species was measured by the number of countries in which it was mentioned as a major weed in cotton. It should be kept in mind that if a particular species was not mentioned in a country's contribution, this does not mean that the weed did not occur in cotton, but simply that it was not considered a major weed. As the definition of "major" will differ from contributor to contributor (some mention a total of 30 major weeds, while others limit their list to less than 10), our short list does not reflect the total economic importance of each weed in objective terms. However, it does give a first indication and

also points at those areas in which the international exchange of research data can be most fruitful.

Of the total number of genera or species mentioned, only 35 were mentioned more than once. In total, ten genera or species were mentioned at least six times. As can be seen in the table on page 8, they include five grasses and five broadleaf weeds. In some cases, the families are represented by only one species. This is the case of *Portulaca oleracea* (common purslane), *Solanum nigrum* (black nightshade), and *Sorghum halepense* (Johnson grass). In some other cases, one or two species dominated: *E. colonum and E. crusgalli,* in the case of *Echinochloa spp.; D. sanguilanis* in the case of *Digitaria* spp, and *C. rotundus* (Bermuda grass) in the case of *Cyperus spp.* For *Amaranthus* (pigweeds), *Ipomoea* (morningglory), and *Chenopodium,* the number of important species is such that none of the countries singled out any species in the genus.

Only in the case of the USA, quantified information was provided as to the economic importance of each genus. Data are expressed in estimated percentage yield loss using an average for three seasons (1984 to 1986). It appears that *Ipomoea spp.,* which is the single most important genus, is re-

sponsible for an average estimated yield reduction of 16 percent. Other important broadleaf weeds are *Xanthium spp.* (cocklebur, estimated yield loss 13%); and *Amaranthus spp.* (pigweeds, estimated loss 9%). For the grasses, two genera represented by only one species are responsible for the lion's share of economic damage (losses of respectively 8.1 and 8.3%): *Sorghum halepense* (Johnson grass) and *Cyperus rotundus* (purple nutsedge).

Consequently, research in the US has been mainly focussing on these 5 major weeds. In a presentation at the 1989 Beltwide Cotton Production Conference, Robert Hayes, of the University of Tennessee, addressed the problem of "hard to kill" morninglories. According to Mr. Hayes, 10 well defined species of morningglory are responsible for an estimated production loss of 15 million dollars. Factors contributing to this problem are the following: little competition from other weeds; its capacity to germinate over a wide range of conditions and its adaptation to various micro-climates; the fact that its seeds are disseminated during harvesting; and its apparent escape from conventional control methods. Present control methods consist of a combination of Treflan or Cotoran with DSMA. Where Cotoran cannot be used Caparol is applied. Mr. Hayes announced that San-

doz agrochemical company made available a grant of US$25,000 for further research in morningglories.

In research reported at the Beltwide Weed Science Conference in 1988, R. S. Baker reported that out of four experimental herbicides tested specifically for morningglory control, the herbicides coded SC-0504 and UBI-9047 were promising. The former applied pre-emergence at a dose of 0.25 lb. active ingredients (ai)/acre in combination with Treflan or Cotoran gave a 74 to 87 percent control of morningglory, and a 64 to 89 percent of general weed control. The product UBI-9047, most effective when applied at a post-emergence dose of 0.06 lb. ai/acre (double of this dose gave an unacceptable injury level in cotton), obtained a control level over morningglory of 53 percent. SC-0504 showed especially excellent cotton selectivity.

In a similar study carried out by B. D. Sims and D. R. Guethle, of the University of Missouri, it was found that post-directed sprays of a combination of pre-emergence herbicides and arsenical herbicides like fluometuron with MSMA (1 + 2 lbs. ai/acre), prometryn + MSMA (0.5 + 2 lbs. ai/acre), and methazole with or without MSMA (0.38 +/-2 lbs. ai/acre), gave excellent (90%) control over *Ipomoea hederacea* (entire leaf morningglory)

when sprayed at the four-inch plant stage. These applications followed a pre-emergence treatment with tifluralin (0.75 lb. ai/acre) and fluometuron (1.5 lbs. ai/acre). The post-directed sprayings were carried out with a hand-held CO_2 backpack sprayer. It was further observed that early post-emergence applications of methazole (at first true leaf) gave high (30%) injury levels to cotton and resulted in yield loss. Also, it was found that fluometuron, applied at this stage, was more harmful to cotton than applied either earlier (cotyledon stage) or later (four-inch stage).

In summary, it can be concluded that control of morningglories is still a trial and error process since a highly selective broadleaf herbicide does not exist yet. Presently, mixtures of pre-emergence herbicides with arsenical herbicides post-directed after a standard pre-emergence program give the best control. However, applications should be well timed and well directed since the costs are high and potential injury levels of cotton are significant.

MAJOR WEEDS IN COTTON CULTIVATION

BROADLEAFS

	Amaranthus spp	Chenopodium spp	Ipomoea spp	Portulaca Oleracea	Solanum Nigrum
ARGENTINA	x		x	x	
AUSTRALIA			x		x
COLOMBIA	x		x	x	
GREECE	x	x			x
HONDURAS	x		x	x	
MEXICO	x	x	x	x	
PAKISTAN	x		x		
PARAGUAY			x		
PERU	x	x	x	x	x
SPAIN	x	x		x	x
SYRIA	x	x		x	x
USA	x	x	x	x	x
ZIMBABWE	x		x		
TOTAL	**11**	**6**	**10**	**8**	**6**

MAJOR WEEDS IN COTTON CULTIVATION

GRASSES

	Cynodon spp	Cyperus spp	Digitaria spp	Echinochloa spp	Sorghum Halepense
ARGENTINA		x	x	x	x
AUSTRALIA				x	
COLOMBIA		x	x	x	
GREECE	x	x			x
HONDURAS	x	x	x		
MEXICO				x	
PAKISTAN	x	x		x	
PARAGUAY					x
PERU		x		x	x
SPAIN	x		x	x	x
SYRIA	x	x	x	x	x
USA	x	x	x	x	x
ZIMBABWE	x		x		
TOTAL	**7**	**8**	**7**	**9**	**7**

Sources:

Hayes, Robert M., "Controlling Hard-to-Kill Morningglories in Cotton," presentation at the Beltwide Cotton Production Conference, Nashville, 1989.

Baker, R. S., "Experimental Herbicides for Morningglory Control in Cotton," *Proceedings of the Beltwide Cotton Production Research Conferences,* Las Vegas, 1988.

Sims, B. D. and Guethle, D. R., "Control Systems for Morningglory and Velvetleaf Management in Cotton," *Proceedings of the Beltwide Cotton Production Research Conferences,* Las Vegas, 1988.

ICAC, *Cotton Production, Harvesting and Ginning with Special Emphasis on Fiber Quality,* Background Document to the 46th Plenary Meeting of the ICAC, 1987.

Insecticide Resistance in Colombia

A study by the Federación Nacional de Algodoneros in Colombia indicates the buildup of resistance in *Heliothis virescens* against Cypermetrine and Fenvalerate. An experiment conducted in the region of Espinal consisted of 5 plots in which larvae were collected in three sample periods. In total 3870 larvae were subject to insecticide efficiency tests using discriminatory doses of the two pyrethroids as well as of methyl parathion. Survivors were counted after a 48-hour exposure in the laboratory. Lethal doses (LD) of 50 and 90 percent were calculated for Fenvalerate and methyl parathion.

It could be shown that there was a significant buildup of resistance during the months of May and June in the case of the two pyrethroids. Data indicated a stable situation for methyl parathion. However, there appeared to be a large difference over locations as to the survivor rates, ranging for example from 13 to 51 percent for Fenvalerate in June. To put the situation in perspective, it should be noted that during the period 1978-1981 resistance of *Heliothis virescens* to Fenvalerate in the same region inceased al-

most sevenfold. Similarly the same insect managed to increase its resistance to methyl parathion during the years 1970-1977, by a factor 16 (according to LD50 tests).

The study recommends establishing a permanent resistance monitoring system to provide a solid foundation for a resistance management strategy based on ecological zones. Presently 74 percent of the region receives about 0.5 lts/ha of pyrethroids in an average of 4.8 sprayings. The remainder of the area is covered by carbamates (20%) and methyl parathion (5%).

In a contribution to the *Cotton Grower* magazine of February 1989, Dr. M. Collins of ICI reports that indeed recently a resistance monitoring group was formed in Colombia, consisting of representatives of producers, the industry and the government. A "window" strategy, allowing only the use of pyrethroids in a 30 day period against the second generation of boll worms is proposed. The program is to be implemented in the 1989/90 season. On an invitation by ICI a delegation of Colombian researchers visited Australia in 1988 to study insect resistance management in that country.

Short Notes

- In the September 1988 issue of *Textile Topics,* a newsletter of the International Center for Textile Research and Development in Lubbock, Texas, USA, it is reported that researchers have found a **new procedure for dyeing of neps**. Presently, the chemical process is under evaluation by the finishing industry, and no details are made available yet. However, the research project, conducted under the responsibility of Dr. R. D. Mehta, shows that a fabric filed with a 2.6 micronaire cotton, initially full of visible neps after conventional dyeing, after being pro-treated according to the new process obtained the same appearance, in terms of shade and visual neps, as a similar fabric filled with 4.6 micronaire cotton. At this stage, as the newsletter states, it seems that the additional costs would not be prohibitive for commercial application of the new procedure. It further calculates that in Texas, where in 1987 thirty percent of the cotton was discounted because of low micronaire, the producers could gain up to US$27 million if this new technology would make discounting for low micronaire an obsolete practice.

- A new book on **interspecific hybridization** was published in Belgium by the University of Gembloux. The volume only available in French is titled *L'amélioration du cotonnier Gossypium hirsutum L. per hybridation inter-spécifique.* The book, subdivided in three parts, discusses the evolution of species within the *Gossypium* genus, the methods of introgression and a review of the results so far obtained by interspecific hybridization. The authors, V. Ndungo, J. Demol and R. Maréchal, have gained extensive experience with this type of breeding at the Institut National pour l'Etude et la Recherche Agronomiques in Zaire. Mr. Ndungo is responsible for cotton improvement at this institute and is presently working at the University of Gembloux in Belgium. The publication can be ordered from the Faculté des Sciences Agronomiques de Gembloux, Bibliothèque-Comité d'Edition, Passage des Déportés, 2, B-5800 Gembloux, Belgium, and costs 600 BF.

- In the USA, **the 1988 Cotton Research Recognition Award went to Dr. Robert R. Bridge**, plant breeder at the Mississippi Agricultural Research Station in Stoneville. Dr. Bridge was especially recognized for his work on early maturing varieties of which four commercial lines have been re-leased since 1978. Presently, 100 percent of the Mississippi cotton

acreage is planted with early maturing varieties, against only 15 percent a decade ago. **The Cotton Genetics Award was given to Dr. Jerry Quisenberry**, plant breeder at USDA's Research Station in Lubbock, Texas. The award, made available by the commercial breeders, was issued for the important contribution Dr. Quisenberry has made to the genetic improvement of cotton and his research input in multi-disciplinary studies on plant water stress. Both prizes were presented at the 1989 Beltwide Cotton Production Research Conference in Nashville in early January. At the same time, a new three year education program on plant physiology was announced. The program, to be guided by a task force under the auspices of the Cotton Foundation, would aim at enhancing growers' awareness of the importance of plant physiology by means of brochures, videos and regional seminars. A video on plant mapping, the tracing of every fruit position throughout the season, was presented as a first contribution.

- Researchers In Lubbock, Texas, have compared **root development** of cotton under irrigated and dryland conditions, both in a semi-arid environment. In an experiment over two years (1986, 1987), D. Upchurch, R. Lascano, B. McMichael and W. Lyle have measured root growth along

with leaf surface area, total biomass and phenological development on a weekly basis. It was shown that both root intensity and rooting depth were increased under dryland conditions as compared to irrigated cotton, although the difference in the latter was only 0.1 m. Rooting depth for dryland cotton reached 1.6 m. In 1986 (a "wet" year) and 1.9 m. in 1987 (a "dry" year). Maximum difference in rooting intensity was 4 km/m^2 in favor of dryland cotton. This difference was reached about two months after planting in 1987. Interestingly, this difference was reduced again to 2 km/m^2 towards the end of the growing season. Also, root length density (measured in km/m^3) was consistently higher In the case of dryland cotton. The authors conclude that there is a significant difference in development of root systems under both conditions studied. However, the difference is reduced when rainfall alleviates some water stress in the dryland crop. They further state that the increased development of the root system is accompanied by a decrease in the leaf area, which brings them to the hypothesis that the plant responds to water stress by directing more photosynthate to the root system at the expense of leaf area (which also contributes to less water use). Research to be published in the proceed-

ings of the International Conference on Dryland Farming, Texas, USA, 1988.

- The importance of **rotor spinning** in the US textile market keeps growing. Presently, 33 percent of all units are non-ring systems and in terms of market share these systems take account of about 40 percent of the total volume of cotton spun into yarn. This market share is, according to Helmut Deussen of America Schlafhorst Company, likely to reach about 60 percent in the year 2000. Also rotor spin technology is advancing rapidly. While in 1975 only yarn counts of up to 16 count could economically be spun on rotor systems with rotor speeds to 45,000 rpm, presently it is economical to spin rotor yarns of 30's and 40's count with rotor speeds close to 100,000 rpm. To translate this to fiber quality demands, it should be understood that rotor spun yarns require a higher number of fibers in the cross section. Mr. Deussen, in a presentation at the Beltwide Conferences, explained that an absolute minimum is 80 to 100 fibers. Therefore, we see a closer correlation between fiber strength and yarn strength, which leads to the conclusion that yarn strength is the single most important fiber quality for rotor spun yarns. Secondly, fiber fineness is important because it determines the maximum number of fibers in the

cross section In a given yarn count. With a micronaire of 2.5, a yam count up to 45 is feasible with the rotor spun system, while with a micronaire of 4.5 a yarn count of 30 is hardly spinnable. Mr. Deussen further stated that a strength in the order of 28 g/tex (HVI measured) is required to obtain good quality rotor spun yarns.

- In the USA, the Cotton Division of USDA-ARS plans to equip all HVI systems of the classing-offices throughout the country with automatic trash meters before the 1991 crop year. After two years of intense evaluation by the Quality Control Section, the **video trash meters** are giving stable results for every grade of cotton. In its present configuration, the video camera scans a sample of cotton and provides the percentage (up to one decimal) of surface covered by non-lint particles as they contrast against the background of the sample. Dr. Ramey, of the Quality Control Section based in Memphis, reports that in an experiment including seven regional classing offices, up to 79 percent of the tested samples yielded the same results (more or less 0.1%) when tested in Memphis after initially being tested at the regional offices. The average difference was 0.08 percent which, according to Dr. Ramey, is less than the difference between recognized leaf levels. The Advisory Committee on Cotton

Marketing in the USA has recommended that classer's grade be determined as two components: 1) Color grade is to be determined by a classer with the aid of a color meter, and 2) leaf grade is to be determined by a classer with the aid of a trash meter.

A DIALOG Search from the Agricola Database on Weed Science

The following list of references was obtained through a data search in the Agricola database of the National Agricultural Library and the Agris database of FAO. *Thresholds* was used as keyword.

To obtain copies of quoted articles in Agricola, readers are invited first to consult their local and national libraries. As a last resort, readers can refer to the Secretariat who, by way of trial, will serve as an intermediary between readers and the National Agricultural Library. To make use of this service, readers would circle a reference and send it with their mailing address to the Secretariat. Only a limited number of references can be handled. For references from Agris no such service is available.

This issue's data search contains references on the use of economic thresholds in cotton pest control from both the Agicola and Agris databases.

SAMPLE RECORD

The positions of the key fields are shown in the following sample record.

AN GP 79009145 79375315 A 1.38-1365 S/N 001-001-0048-3
HL Holding Library: GPO; GPO; AGL
TI Wilderness management
AU Hendee, John C.; Stankey, George H.
CS United States. Forest Service
PU (Washington). Dept. of Agriculture, Forest Service, for sale by the Supt. of Docs., U.S. Govt. Print. PY CP Off., 1978 DISTRICT OF COLUMBIA
xi, 381 p. ; ill., maps; 27 cm. --
SE U.S. Dept. of Agriculture. Miscellaneous publication; no. 1365
LC BN LCCN 77000600-039 ISBN ---$10.50
CA NAL: 1 Ag84M no. 1365
LA Languages: ENGLISH
Includes bibliographies and index

SF Subfile: USDA. (US DEPT. AGR);
GS Government Source: FEDERAL
DT Document Type: MONOGRAPH
DE Descriptors: Wilderness areas--United States;
SH Section Headings: GENERAL NATURAL RESOURCES AND ENVIRONMENTAL POLLUTION (6505); FOREST ECONOMICS AND MANAGEMENT (3510

Key to Data Fields

AB Abstract
AN Accession Number
AU Author
BN ISBN
CA Call Number
CL Conference Location
CN Contract Number
CO CODEN
CP Country of Publication
CS Corporate Source
CT Conference Title
CY Conference Year
DE Descriptor
DT Document Type

ED	Edition
GL	Geographic Location
GP	GPO Number
GS	Government Source
HL	Holding Library
JN	Journal Name
LA	Language
LC	Library of Congress Card Number
NT	Note
PU	Publisher
PY	Publication Year
SE	Series
SF	Subfile
SH	Section Heading Code
SN	ISSN
SP	Sponsoring Agency
TI	Title

Data present in record depends on output format requested and type of record.

88103247 88054837 Holding Library: AGL
Interference periods of common coclebur (Xanthium strumarium) with cotton (Gossypium hirsutum)

Snipes, C.E.; Stree, J.E.; Walker, R.H.
Weed science. July 1987. v. 35 (4) p. 529-532.
Champaign. Ill.: Weed Science Society of America. ISSN: 0043-1745 CODEN: WEESA6
DNAL CALL NO: 79.8 W41
Language: English

88095848 88049743 Holding Library: AGL
Comparison of methods for spot treating johnsongrass in cotton
Hurst, H.R.: Williford, J.R.
Bulletin - Mississippi Agricultural and Forestry Experiment Station. June 1988. (955)
11p. ill.
Mississippi State, Miss.: The Station. ISSN: 0898-0497
CODEN: MAEBB
DNAL CALL NO: S79.E3
Language: English

88094441 88048006 Holding Library: AGL
Postemergence contol of annual morning-glory in cotton Blythe California
Cudney, D.W.; Ede.L.
Research progress report - Western Society of Weed Science. 1988. p. 249-250.
[S.l.]: The Society. ISSN: 0090-8142
DNAL CALL NO: 79.9 W52R
Language: English

88093906 88047312 Holding Library: AGL
Efficacy and economics of pendimethalin herbicide combinations for weed control in cot - ton (Gossypium hirsutum L.)
Wilcut, J.W.; Patterson, M.G.; Wehtje, G.R.; Whitwell, T.
Applied agricultural research. 1988. v. 3 (4) p. 203-208.
New York, N.Y. : Springer. ISSN: 0179-0374 CODEN: AAREEZ
DNAL CALL NO: S539.5.A77
Language: English

88088395 88042773 Holding Library: AZUA; AGL
Weed control
Frans, R.E.; McClelland, M.R.
Arkansas farm research - Arkansas Agricultural Experiment Station. July/Aug 1988. v. 37 (4) p. 4.
Fayetteville, Ark.: The Station. ISSN: 0004-1785
CODEN: AKFRAC
DNAL CALL NO: 100 AR42F
Language: English

88074674 88029882 Holding Library: AGL
Growth and reproduction of black nightshade in cotton
Keeley, P.E.; Thullen, R.J.
Proceedings - California Weed Conference. 1988. (40) p. 220-221

Sacramento, Calif.: California Weed Conference Office. ISSN: 0097-1731
DNAL CALL NO: 79.9 C122
Language: English

88063766 88022331 Holding Library: AGB
Growth and water relations of cotton (Gossypium hirsutum), spurred anoda (Anoda cris - tata), and velvetleaf (Abutilon theophrasti) during simulated drought and recovery
Patterson, D.T.;
Weed science. May 1988. v. 36 (3) p. 318-324.
Champaign, Ill. : Weed Science Society of America. ISSN: 0043-1745 CODEN: WEESA6
DNAL CALL NO: 79.8 W41
Language: English

88059033 88027593 Holding Library: AZUA; AGL
Efficacy and soil persistence of Fusarium solani f. sp. cucurbitae for control of Texas gourd (Cucurbita texana)
Weidemann, G.J.; Templeton, G.E.
Plant disease. Jan 1988. v. 72 (1) p. 36-38.
St. Paul, Minn.: American Phytopathological Society. ISSN: 0191-2917 CODEN: PLDIDE
DNAL CALL NO: 1.9 P69P
Language: English

88055333 88017772 Holding Library: AGL
Chemical weed control in cotton
Brown, S.M.;
Bulletin - Cooperative Extension Service, University of Georgia, College of Agricultu re. Nov 1987. (826. Re.) 11 p. ill.
Athens, Ga.: The Service. ISSN: 0092-9077
DNAL CALL NO: 275.29 G29B
Language: English

88050110 88012320 Holding Library: AGL
1988 cotton: preplant and preemergence weed control
Houston, D.W.; McCarty, W.H.
Publication - Cooperative Extension Service, Mississippi State University. Feb 1988. (1619) 4 p.
State College, Miss. : The Service.
DNAL CALL NO: 275.29 M68EXT
Language: English

88042706 88011116 Holding Library: AZUA; AGL
Effect of concentration and time of application of the defoliant Harvade on the lint, see d, protein and oil yields, and oil properties of cottonseed
Sawan, Z.M.; Hefni, El-S.H.M.; Allam, M.A.
Experimental agriculture. Jan 1988. v. 24 (1) p. 123-127.

Cambridge: Cambridge University Press. ISSN: 0014-4797 CODEN: EXAGA
DNAL CALL NO: 10 EX72
Language: English Summary Language: Spanish

88026419 87105906 Holding Library: AGL
RE-40885: a new broadleaf herbicide in cotton, peanut, sorghum and sunflower
Rogers, D.D.; Kirby, B.W.; Hulbert, J.C.; Bledsoe, M.E.; Hill, L.V.; Omid, A.; Ward, C.E.
Proceedings of the British Crop Protection Conference-Weeds. 1987. v. 1 p. 69-75.
Surrey: British Crop Protection Council. ISSN: 0144-1604
DNAL CALL NO: SB610.2.B74
Language: English

88020977 87104911 Holding Library: AGL
1988 cotton pest management. Weed, insect, disease, & nematode control recommen - dations
Patterson, M.G.; Everest, J.W.; Chapman, L.J.; Eich, S.M.; Smith, R.H.; Freeman, B.; Gaylor, M.J.; Gazaway, W.S.
Circular ANR - Cooperative Extension Service, Auburn University. Oct 1987. (415) 19 p. ill.
Auburn, Ala.: The Service.
DNAL CALL NO: S544.3.A2C47
Language: English

88013438 87104507 Holding Library: GUA; AGL
Chemical weed control in cotton
Brown, S.M.;
Bulletin - Cooperative Extension Service, University of Georgia, College of Agricultu re. Nov 1987. (826) 11p.
Athens, Ga. : The Service.
DNAL CALL NO: 275.29 G29B
Language: English

88000472 87090445 Holding Library: AGL
Full-season interference of silverleaf nightshade (Solanum elaeagnifolium) with cotton (Gossypium hirsutum)
Green, J.D.; Murray, D.S.; Verhalen, L.M.
Weed science. Nov 1987. v. 35 (6) p. 813-818.
Champaign, Ill. : Weed Science Society of Amercia. ISSN: 0043-1745 CODEN: WEESA6
DNAL CALL NO: 79.8W41
Language: English

88000471 87090444 Holding Library: AGL
Interference of unicorn plant (Proboscidea louisianica) with cotton (Gossypium hirsutum)
Mercer, K.L.; Murray, D.S.; Verhalen, L.M.
Weed science. Nov 1987. v. 35 (6) p. 807-812.

Champaign, Ill. : Weed Science Society of America. ISSN: 0043-1745 CODEN: WEESA6
DNAL CALL NO: 79.8W41
Language: English

87125877 87071526 Holding Library: AGL
Weed control in a conservation tillage rotation in the Texas blacklands
Brown, S.M.; Chandler, J.M.; Morrison, J.E. Jr.
Weed science. Sept 1987. v. 35 (5) p. 695-699.
Champaign, Ill. : Weed Science Society of America. ISSN: 0043-1745 CODEN: WEESA6
DNAL CALL NO: 79.8 W41
Language: English

87093451 87047475 Holding Library: AGL
An introdution to RE-40885, a new broadleaf and grass herbicide
Fulford, A.D.; Bishop, T.D.; Rich, G.J.
Proceedings of the...Beltwide Cotton Production Conference. 1987. p. 134.
Memphis: National Cotton Council.
DNAL CALL NO: SB245.B42
Language: English

87093450 87047474 Holding Library: AGL
A comparison of cotton yield response to PPI applications of pendimethalin and triflu - ralin for weed control
Cranfill, B.E.; Rhodes, A.R.
Proceedings of the...Beltwide Cotton Production Conference. 1987. p. 131-133.
Memphis: National Cotton Council.
DNAL CALL NO: SB245.B42
Language: English

87093404 87047428 Holding Library: AGL
Controlling broadleaf weeds: control practices promising new herbicides
Bonner, C.M.;
Proceedings of the...Beltwide Cotton Production Conference. 1987. p. 11-12.
Memphis: National Cotton Council.
DNAL CALL NO: SB245.B42
Language: English

87091495 87044862 Holding Library: AGL
Documentation of weed infestation levels in Louisiana cotton
Sanders, D.;
Proceedings - Beltwide Cotton Production Research Conferences. 1987. p. 365.
Memphis, Tenn.: National Cotton Council and The Cotton Foundation. CODEN: BCOPB
DNAL CALL NO: SB249.N6

Language: English

87091494 87044861 Holding Library: AGL
Report of the 1986 cotton weed loss committee
Patterson, M.; Monka, D.
Proceedings - Beltwide Cotton Production Research Conferences. 1987. p. 361-364.
Memphis, Tenn.: National Cotton Council and The Cotton Foundation. CODEN: BCOPB
DNAL CALL NO: SB249.N6
Language: English

87091493 87044860 Holding Library: AGL
Controlling purple nutsedge on fallowed ground with EPTC and butylate
Chernicky, J.R.; Heathman, E.S.; Stedman, S.W.; Barstow, B.
Proceedings - Beltwide Cotton Production Research Conferences. 1987. p. 359-360.
Memphis, Tenn.: National Cotton Council and The Cotton Foundation. CODEN: BCOPB
DNAL CALL NO: SB249.N6
Language: English

87091492 87044859 Holding Library: AGL
Factors affecting the response of cotton to preplant applications of EPTC and butylate
Chernicky, J.P.; Heathman, E.S.; Hamilton, K.C.; Barstow, B.
Proceedings - Beltwide Cotton Production Research Conferences. 1987. p. 358-359.
Memphis, Tenn.: National Cotton Council and The Cotton Foundation. CODEN: BCOPB

DNAL CALL NO: SB249.N6
Language: English

87091491 87044858 Holding Library: AGL
Historical perspective: soil injection of thiocarbamates for nutsedge control in cotton
Baker, R.S.
Proceedings - Beltwide Cotton Production Research Conferences. 1987. p. 356-358.
Memphis, Tenn. : Natioanl Cotton Council and The Cotton Foundation. CODEN: BCOPB
DNAL CALL NO: SB249.N6
Language: English

87091490 87044857 Holding Library: AGL
Biological control of nutsedges
Phatak,, S.C.;
Proceedings - Beltwide Cotton Production Research Conferences. 1987. p. 354-356.
Memphis, Tenn.: National Cotton Council and The Cotton Foundation. CODEN: BCOPB
DNAL CALL NO: SB249.N6
Language: English

87091488 87044855 Holding Library: AGL
Nutsedge: the problem and its control in western irrigated cotton
Vargas, R.; Heathman, S.
Proceedings - Beltwide Cotton Production Research Conferences. 1987. p. 350-352.

Memphis, Tenn.: National Cotton Council and The Cotton Foundation. CODEN: BCOPB
DNAL CALL NO: SB249.N6
Language: English

87091487 87044854 Holding Library: AGL
Nutsedge problems in Texas and Oklahoma and current control practices
Weaver, D.N.;
Proceedings - Beltwide Cotton Production Research Conferences. 1987. p. 350.
Memphis, Tenn.: National Cotton Council and The Cotton Foundation. CODEN: BCOPB
DNAL CALL NO: SB249.N6
Language: English

87091486 87044853 Holding Library: AGL
Nutsedge problems in southeastern cotton
Patterson, M.; Monks, D.
Proceedings - Beltwide Cotton Production Research Conferences. 1987. p. 349.
Memphis, Tenn.: National Cotton Council and The Cotton Foundation. CODEN: BCOPB
DNAL CALL NO: SB249.N6
Language: English

87091485 87044852 Holding Library: AGL
The nutsedge problem from a producer’s viewpoint
Bowers, R.N.;

Proceedings - Beltwide Cotton Production Research Conferences. 1987. p. 349.
Memphis, Tenn.: National Cotton Council and The Cotton Foundation. CODEN: BCOPB
DNAL CALL NO: SB249.N6
Language: English

87091484 87044851 Holding Library: AGL
Controlling annual grasses with new herbicides
Wiese, A.F.; Chenault, E.W.
Proceedings - Beltwide Cotton Production Research Conferences. 1987. p. 345.
Memphis, Tenn.: National Cotton Council and The Cotton Foundation. CODEN: BCOPB
DNAL CALL NO: SB249.N6
Language: English

87089320 87041467 Holding Library: AGL
The effect of low amounts of water on the incorporation of preemergence herbicides
Lourens, A.F.; Lange, A.H.
Research progress report - Wester Society of Weed Science. 1987. p. 365-366.
[S.1.]: Western Society of Weed Science. ISSN: 0090-8142
DNAL CALL NO: 79.9 W52R
Language: English

87089245 87041392 Holding Library: AGL
The effect of initial irrigation on the activity of two preemergence herbicides

Lange, A.H.; Lange, K.F.
Research progress report - Wester Society of Weed Science. 1987. p. 220-221.
[S.1.]: Western Society of Weed Science. ISSN: 0090-8142
DNAL CALL NO: 79.9 W52R
Language: English

87089244 87041391 Holding Library: AGL
The evaluation of glyphosate, paraquat and oxyfluorfen for the control of winter annual broadleaves on cotton fallow beds
Varga, R.;
Research progress report - Wester Society of Weed Science. 1987. p. 219.
[S.1.]: Western Society of Weed Science. ISSN: 0090-8142
DNAL CALL NO: 79.9 W52R
Language: English

87089243 87041390 Holding Library: AGL
Cyanazine combinations preplant for broadleaf weed control in cotton
Chernicky, J.R.; Heathman, E.S.; Hamilton, D.C.; Barstow, B.
Research progress report - Wester Society of Weed Science. 1987. p. 217-218.
[S.1.]: Western Society of Weed Science. ISSN: 0090-8142
DNAL CALL NO: 79.9 W52R
Language: English

87089242 87041389 Holding Library :AGL
Factors affecting the response of cotton to preplant applications of EPTC and butylate
Chernicky, J.P.; Heathman, E.S.; Hamilton, K.C.; Barstow, B.B.
Research progress report - Wester Society of Weed Science. 1987. p. 213-215.
[S.1.]: Western Society of Weed Science. ISSN: 0090-8142
DNAL CALL NO: 79.9 W52R
Language: English

87089094 87041241 Holding Library: AGL
Weeds in agronomic crops--cotton
York, A.C.;
Proceedings - Southern Weed Science Society. 1987. (40th) p. 11-20.
Champaign: The Society. ISSN: 0362-4463 CODEN: SWSPB
DNAL CALL NO: 79.9 SO8
Language: English

87083830 87038585 Holding Library: AGL
1987 Cotton pest management--weed, insect, disease, and nematode control recom - mendations
Gazaway, W.S.; Chapman, L.J.
Circular ANR - Cooperative Extension Service. Auburn University. Jan 1987. (415) 19 p.
Auburn, Ala.: The Service.
DNAL CALL NO: S544.3.A2C47

Language: English

87075114 87030016 Holding Library: AGL
Selective control of johnsongrass (Sorghem halepense) in cotton (Gossypium hirsutum) with foliar herbicides
Carter, C.H.; Keeley, P.E.
Weed science. May 1987. v. 35 (3) p. 418-421.
Champaign, Ill. : Weed Science Society of America. ISSN: 0043-1745 CODEN: 79.8 W41
Language: English

87075109 87030011 Holding Library: AGL
Annual grass control in cotton (Gossypium hirustum) with fluazifop, sethoxydim, and se - lected dinitroaniline herbicides
Byrd, J.D. Jr.; York, A.D.
Weed science. May 1987. v. 35 (3) p. 388-394.
Champaign, Ill.: Weed Science Society of America. ISSN: 0043=1745 CODEN: WEESA6
DNAL CALL NO: 79.8 W41
Language: English

87075096 87029998 Holding Library: AGL
Interference of hemp sesbania (Sesbania exaltata) with cotton (Gossypium hirsutum)

Bryson, C.T.;
Weed science. May 1987. v. 35 (3) p. 314-318.
Champaign, Ill. : Weed Science Society of America. ISSN: 0043-1745 CODEN: WEESA6
DNAL CALL NO: 79.8 W41
Language: English

87071081 87024341 Holding Library: AGL
Herbicide field evaluation trials on field crops. 1986
Frans, R.; Corbin, B.; Johnson, D.; McClelland, M
Research series- University of Arkansas Agricultural Experiment Station. Mar 1987. (354) 92 p.
Fayetteville: The Station.
DNAL CALL NO: S541.5.A8R47
Language: English

87054637 87016750 Holding Library: AGL
Interaction of fluometuron and MSMA with sethoxydim and fluazifop
Byrd, J.D. Jr.; York, A.C.
Weed science. Mar 1987. v. 35 (2) p. 270-276.
Champaign, Ill. : Weed Science Society of America. ISSN: 0043-1745 CODEN: WEESA6
DNAL CALL NO: 79.8 W41

Language: English

87054624 87016737 Holding Library: AGL
Influence of planting date on growth of Palmer amaranth (Amaranthus palmeri)
Keeley, P.E.; Carter C.H.; Thullen, R.J.
Weed science. Mar 1987. v. 35 (2) p. 199-204.
Champaign, Ill. : Weed Science Society of America. ISSN: 0043-1745 CODEN: WEESA6
DNAL CALL NO: 79.8 W41
Language: English

87054619 87016732 Holding Library: AGL
Influence of date of planting on the growth of yellow nutsedge (Cyperus esculentus)
Thullen, R.J.; Keeley, P.E.
Weed science. Mar 1987. v. 35 (2) p. 173-176.
Champaign, Ill. : Weed Science Society of America. ISSN: 0043-1745 CODEN: WEESA6
DNAL CALL NO: 79.8 W41
Language: English

87035237 87005531 Holding Library: AGL
Repeated annual applicaiton of herbicides for control of rhizome johnsongrass (Sor - ghum halepense) in cotton (Gossypium hirsutum)

Keeley, P.E.; Thullen, R.J.; Carter, C.H.
Weed science. Jan 1987. V. 35 (1) p. 75-80.
Champaign, Ill. : Weed Science Society of America. ISSN: 0043-1745 CODEN: WEESA6
DNAL CALL NO: 79.8 W41
Language: English

87035235 87005529 Holding Library: AGL
Influence of johnsongrass (Sorghum halepense) density and period of competition on cotton yield
Bridges, D.C.; Chandler, J.M.
Weed science. Jan 1987. v. 35 (1) p. 63-67.
Champaign, Ill. : Weed Science Society of America. ISSN: 0043-1745 CODEN: WEESA6
DNAL CALL NO: 79.8 W41
Language: English

87035232 87005526 Holding Library: AGL
Germination and the potential persistence of weedy and domestic okra (Abelmoschus esculentus) seeds
Egley, G.H.; Elmore, C.D.
Weed science. Jan 1987. v. 35 (1) p. 45-51.

Champaign, Ill. : Weed Science Society of America. ISSN: 0043-1745 CODEN: WEESA6
DNAL CALL NO: 79.8 W41
Language: English

1075104 AGRIS No: 88-102920
Seed cotton yield and weed population in response to pre and post emergence applica - tion of herbicides
Akhtar, M.; Hassan, Y.; Nazir, M.W.; Cheema, Z.A.
(University of Agricutlure, Faisalabad (Pakistan). Dept. of Agronomy)
Journal of Agricultural Research, Sep 1986, v. 24(3) p. 197-202
Language: English Summary Language: English

1075103 AGRIS No: 88-103919
Effect of post emergence weedicides on the yield and yield component of cotton (Gossypium hirsutum L.)
Ansari, A.H. (Pakistan Agricultural Research Council, Islamabad (Pakistan)); Khuskh, A.M.; Memon, M.Y.; Qayyum, S.M.
Pakistan Journal of Scientific and Industrial Research, Apr 1988, v. 31 (4) p. 285-287
Language: English Summary Language: English

1075102 AGRIS No: 88-102918
Mixtures of herbicides against weeds in annual cotton (Misturas de herbicidas no con-

trole de ervas daninhas em algodoeiro anual)
Azevedo, D.M.P. de; Beltrao, N.E. de M.; Nobrega, L.B. da Pesquisa Agropecuaria Brasileira. Aug 1987, v. 22(8) p. 797-802.
Language: Portuguese Summary Language: English, Portuguese

1063726 AGRIS No: 88-086717
The effect of some herbicides on weed control and growth of cotton plant
Zaki, S.Z. (Central Cotton Research Inst., Multan);
Hussain, M.R. (University of Agriculture, Faisalabad (Pakistan). Dept. of Agronomy);
Makhdum, M.E.; Masood, T.
Sarhad Journal of Agriculture. Apr 1988. v. 4 (2) p. 185-189
Language: English Summary Language: English

1063725 AGRIS No: 88-086716
Preliminary studies of the pre-emergence and post-emergence weeds of cotton in D.G. Khan Pakistan
Malik, S.A.; Bokhari, M.H.; Dasti, A.A. (Gomal Univ., D.I. Khan (Pakistan))
Sarhad Journal of Agriculture, Apr 1988. v. 4 (2) p. 173-184
Language: English Summary Language: English

1063724 AGRIS No: 88-086715
Herbicide - plant disease relationsips: effect of soil herbicides on Rhizoctonia damping - off on cotton seedlings in Egyptian fields

Khalifa, M.A.S.; El-Deeb, S.T.; Kadous, E.A.; Hassan, A.; Soliman, F.S. (Alexandria Univ. (Egypt). Plant Protecteion Dept.)

39. International Symposium on Crop Protection. Gent (Belgium), 5 May 1987

Internationaal Symposium over Fytofarmacie en Fytiatrie, Rijksuniversiteit Faculteit Landbouwwetenschappen, Gent, 1987, v. 39 (pt.4) p. 1233-1243

Language: English Summary Language: English

1059159 AGRIS No: 88-079812

Pre-extension activities for chemical weed control in cotton and maize crops in Benin dipropetryne + metochlor, atrazine + metolachlor (La prevulgarisation des traitements herbicides en culture cotonniere et en maisiculture au Benin dipropetryne + meto - lachlore, atrazine + metolachlore)

Gaborel, C. (Recherche Coton et Fibres, Cotonou (Benin)) 13. Conference du CO - LUMA. Journees d'etudes sur le desherbage, Versailles (France). 9-10 Dec 1986

Proceedings of the 13. conference of COLUMA Comite de Lutte contre les Mauvasies Herbes. Study days on weed control. 9-10 December 1988, Versailles (France) (Compte rendu de la 13. conference du COLUMA Comite de Lutte contre les Maus - vaises Herbes. Journees d'etudes sur le desherbage. 9-10 decembre 1986, Versailles (France))

Association Nationale pour la Protection des Plantes, Boulogne-Billancourt (France)

Boulogne-Billancourt (France): ANPP, 1987, v. 2 p. 245-252

ANPP Annales (France), no. 2

Language: French Summary Language: French

1054435 AGRIS No: 88-072570
Effect of weed control practices on weed density and yield of cotton (Gossypium hirsu - tum L.)
Cheema, Z.A.; Afzal, M.; Ahmad, S. (University of Agriculture, Faisalabad (Pakistan). Dept. of Agronomy)
Pakistan Journal of Weed Science Research, 1988. v. 1(1) p. 34-40
Language: English Summary Language: English

1054434 AGRIS No: 88-072569
A review of weed control research in cotton in Ethiopia
Tadesse Eshetu; Ahmed M Sherif (Institute of Agricultural Research. P.O. Box 2003. Ad - dis Ababa (Ethiopia))
Proceedings of the First Ethiopian Crop Protection Symposium. Addis Ababa (Ethiopia), 4-7 Feb 1985
A review of crop protection research in Ethiopia
Tsedeke Abate (ed.)
Institute of Agricultural Research, Addis Ababa (Ethiopia)
Addis Ababa (Ethiopia): IAR, 1986, p. 233-246
Language: English

1048259 AGRIS No: 88-064208
Biological activity of indigenous plants on germination of four weed species on cotton
Solsoloy, A.D.; Panapanaan, V.; Calosa, L.; Damo, M.; Solsoloy, T.

Technical report CY [Calendar Year] 1985-86
Cotton Research and Development Inst., Batac, Ilocos Norte (Philippines)
Batac, Ilocos Norte (Philippines), 1987, p. 190-196
Language: English Summary Language: English

1048258 AGRIS No: 88-064207
Absorption, translocation and metabolism of the herbicide orbencarb in cotton plant
Ikeda, M.; Unai, T. (Kumiai Chemical Industry Co. Ltd., Kikugawa, Shizuoka (Japan). Life Science Research Inst.); Tomizawa, C.
Journal of Pesticide Science, Aug 1986, v. 11(3) p. 379-385
Language: English Summary Language: English, Japanese

1048257 AGRIS No: 88-064206
Trials on chemical weeding in the cotton fields covered with polyethylene films
Zheng Delong: Cheng Deyuan (Datonghu State Farm, Hubei (China). Station of Plant Protection)
China Cottons, Nov 1987, v. 14(6) p. 43, 32
Language: Chinese

1048256 AGRIS No: 88-064205
[The experiment on controlling gramineous weeds with Fluazifop-butyl in cotton field]
Zhong Liansheng: Zia Kexiang (Hubei Provincial Academy of Agricultural Sciences, Wuchang (China). Inst. of Plant Protection)

China Cottons, Nov 1987, v. 14(6) p. 41-42
Language: Chinese

1041526 AGRIS No: 88-054741
Trap crops as a cultural measure in Striga control in Africa
Parkinson, V.; Efron, Y.; Bello, L.; Dashiell, K.
(International Inst. of Tropical Agriculture, Ibadan (Nigeria))
FAO Plant Protection Bulletin, 1987, v. 35(2) p. 51-54
Language: English Summary Language: English, Spanish, French

1026528 AGRIS No: 88-034472
Abstracts of communication [Second Arab Congress of Plant Protection] (Al-mu'tamar al-3ilmi: al-3arabi: al-t'a:ni: li-wiqa:yat al-naba:t Dima''sq, su:riyya:, 24-27 'ad''a:r, 1986)
2. Arab Congress of Plant Protection. Damascus (Syria), 24-27 Mar 1986
Majallat wiqa:yat al-naba:t al-3arabiyyat, Arab Journal of Plant Protection, Jun 1986, v. 4(1) p. 26-51
Language: Arabic

1011179 AGRIS No: 88-014638
[Weed control on cotton fields by means of tillage and application of herbicides] (Bor'ba s sornyakami v posevakh khlopchatnika s pomoshch'yu obrabotki pockvy i gerbitsidov)
Khalilov, K.; Solov'ev, V.R.; Daminov, N.
[Problems of weed control] (Probl. bor'by s sornoj rastitel'nost'yu)

Moscow (USSR), 1986, p. 39-43
Language: Russian

0989845 AGRIS No: 87-085698
Weeds in cotton field are robbers
Gill, M.I.; Saunders, J.H. (Central Cotton Research Inst., Multan (Pakistan))
Pakistan Agriculture, Jun 1987, v. 9(6) p. 13-14
Language: English

0989843 AGRIS No: 87-085696
[Trifluralin - a good herbicide for dry-land weed control]
Wen Zhixia (Station of Plant Protection of Yongxiu County, Jiangxi (China))
Jiangxi Agricultural Sciences and Technology, Apr 1987, (no. 4) p. 31
Language: Chinese

0989842 AGRIS No: 87-085693
[Trial of the herbicide Selectone in cotton] (Prueba del herbicide Selectone en el cultivo del algodon)
Oviedo Z.C.; Velasquez, J.M. (Centro Experimental del Algodon (Nicaragua))
Ministerio de Desarrollo Agropecuario y Reforma Agraria, Managua (Nicaragua). Direc-cion de Algodon y Oleaginosas
Informe de las Labores de la Seccion de Agronomia del Centro Experimental del Algo - don 1985-1986, p. 47-55

Language: Spanish

0989841 AGRIS No: 87-085692
[Comparative trial of Bolero and Prowl herbicides in cotton] (Ensayo comparativo de los herbicidas Bolero vs. Prowl en el cultivo del algodon)
Oviedo Z.C.; Velasquez, J.M. (Centro Experimental del Algodon, Leon (Nicaragua))
Ministerio de Desarrollo Agropecuario y Reforma Agraria, Managua (Nicaragua). Direccion de Algodon y Oleaginosas
Informe de las Labores de la Seccion de Agronomia del Centro Experimental del Algodon 1985-1986, 1986, p. 56-66
Language: Spanish

0977867 AGRIS No: 87-064960
Weed control in cotton
Shad, R.A. (Naitonal Agricultural Research Centre, Islamabad (Pakistan))
Progressive Farming, Jan-Feb 1987, v. 7(1) p. 40-42
Language: English

0957191 AGRIS No: 87-031715
The effect of bermudagrass Cynodon dactylon (L.) pers. on the germination and seedlings growth of cotton and three weeds species (in Iraq) (Ta't ''i:r naba:t al-t"ayil Cynodon dactylon (L.) 3ala 'inba:t bd"u:r wa nimuw ba:d"ira:t al-qut*n Gossypium hirsutum (L.) wa t"ala:t" 'anwa:3 min al-'adg"a:1 (fi: al-3ira:q))
Abdul-Rahman, A.A. (Sci. Res. Council. Baghdad (Iraq).

Agric. Water Reso. Res. Cent., Dept. Plant Prod.); Al-Nabi, F.A.G. (Baghdad Univ., Baghdad (Irag). Coll. of Science)

Mij”alat al-buh”wut” al-zira:3i:a wa al-mawa:rid al-ma:’i:a - Al-’inta:j” al-naba:ty, J. of Agriculture and Water Resources Research - Plant production (Iraq), 1986, v. 5(1) p. 115-128

Language: Arabic Summary Language: Arabic, English

0946823 AGRIS No: 87-014157

A survey of main weed damage in the Shanghis suburbs, with suggestions for its control

Tang Hongyuan; Wang Xuee (Shanghai Municipal Academy of Agricultural Sciences, Shanghai (China). Inst. of Plant Protection)

Acta Phytophylacica Sinica, Sep 1986, v. 13(3) p. 211-216

Language: Chinese Summary Language: Chinese, English