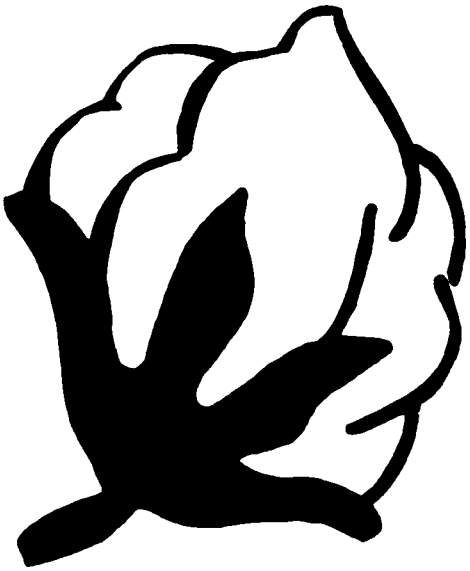


THE ICAC RECORDER

International
Cotton
Advisory
Committee

Technical
Information Section

VOL. XVI NO. 4
DECEMBER 1998

- **Update on cotton production research**
- **Nouvelles recherches cotonnières**
- **Actualidad en la investigación de la producción algodonera**

Contents

Introduction

In the last five years, the ICAC has published a number of articles on organic cotton production in the *ICAC RECORDER,* in addition to papers presented at international forums. The documents were put together in one publication, *Growing Organic Cotton*, in October 1996. Organic cotton production started in the USA, but a number of projects were introduced in many countries by international agencies, partly due to concerns regarding the extensive use of pesticides on conventional production. In the last eight years, organic cotton growers have experienced a number of problems regarding yield, cost of production and price premiums, which affected organic cotton area. In the first article, an update on organic cotton production in the world, in addition to reasons for the recent decline in production, are discussed.

The Technical Information Section of the ICAC has updated the 109-page report, *Survey of the Cost of Production of Raw Cotton.* Data are available on 55 sets of production practices from 29 countries for 1997/98, including the cost of inputs, from pre-sowing to harvesting and ginning. The report is available from the Secretariat in English only, at a price of US$150; however, for French and Spanish speaking countries, a glossary of words most used in the report is included. You can send your orders to <publications@icac.org>. Cost of production data from ten countries, Argentina, Australia, Bolivia, China (Mainland), India, Pakistan, Syria, Turkey, USA and Zimbabwe, has been compared in more detail in the second article.

This issue of *THE ICAC RECORDER* also has some short notes and a Dialog search of the CAB Abstracts Database. The keywords used in the search are Cotton and Nematode.

The World Cotton Research Conference–2, held in Athens, Greece, from September 6-12, 1998, was a great success. WCRC-2 was attended by 641 participants from 46 countries, 560 delegates and 81 accompanying persons. 283 papers on various disciplines were presented as follows:

Discipline	Presentations	
	Oral	Poster
Agronomy	25	8
Breeding, genetics and biotechnology	47	14
Crop protection (including Bt cotton)	74	23
Physiology	33	11
Fiber quality and processing	32	2
Cotton and environment	3	-
Multidisciplinary	6	5

At the 57th Plenary Meeting of ICAC in Santa Cruz, Bolivia, from October 12-16, 1998, a one-day Technical Seminar was held on October 15, wherein eleven papers reflecting the type of work discussed at the WCRC–2 and on cotton contamination were presented. Six papers on contamination dealt with ITMF surveys; avoiding contamination in the field and at the gin; recent developments on testing methods; spinner's views on contamination; a new method for testing trash; and the im-

The ICAC RECORDER (ISSN 1022-6303) is published four times a year by the Secretariat of the International Cotton Advisory Committee, 1629 K Street, NW, Suite 702, Washington DC. 20006, USA. Editor: M. Rafiq Chaudhry. Subscription rate: $145.00.

pact of foreign matter on the textile industry. The publication is available from the ICAC Secretariat. You can send your orders to <publications@icac.org>.

The Pesticides Trust is an independent charity organization addressing the health and environmental problems of pesticides. The Trust, based in the UK, is devoted to minimizing pesticide hazards, promoting effective regulation of pesticides, eliminating trade in hazardous pesticides, reducing pesticide use and advocating sustainable alternatives to chemical pest control. To do this, the Trust works in the areas of research and project development, demonstrating alternatives and information dissemination. On a quarterly basis, the Trust publishes a newsletter called *Pesticides News,* wherein reports on various aspects of pesticide use in agriculture are covered. Since 1995, the Trust has had a number of organic cotton production projects in many countries, particularly in Africa. Based on their own experience with organic cotton production in Benin, Senegal, Zambia, Zimbabwe and elsewhere, the Trust decided to publish a book, *ORGANIC COTTON From Field to Final Product,* which will be out in early 1999. The organic cotton production experience in countries like Egypt, Peru and the USA, where the Trust was not involved directly, has been covered by authors from these countries. The cost of the 234-page book is £14.95 and can be purchased from the following address.

The Pesticides Trust
Eurolink Centre
49 Effra Road
London SW2 1BZ, UK
Phone: 44-171-2748895
Fax: 44-171-2749084
Email: <pesttrust@gn.apc.org>

Organic Cotton Production IV

Cotton is one of the most chemically intensive among all field crops. Cotton is grown on an estimated 3% of the total cultivated area in the world, but uses about 25% of all insecticides consumed in agriculture. Pests are such a serious threat to cotton production that economic yields are almost impossible to achieve without monitoring pests and adopting chemical controls. Plant protection operations have become the crucial aspect of production practices and pesticides that are banned for use on food crops are commonly used on cotton. The table below shows the increase in the number of sprays in Punjab, Pakistan (Punjab produces over 80% of the country's total production). The increase was partly due to stringent efforts to avoid the leaf curl virus disease by controlling the whitefly, and to control the cotton bollworm that has lately emerged as the key pest throughout the cotton belt. In California, USA, the quantity of pesticides used on cotton increased by about 42% from 1991 to 1995 and the quantity of insecticides used on cotton has increased in many countries.

Insect Control in Pakistan

Years	Number of Sprays/Percentage Area							
	Zero	One	Two	Three	Four	Five	Six	Seven
1987	29	20	23	23	4	1	0	0
1988	26	26	21	20	6	1	0	0
1989	9	16	18	26	18	13	0	0
1990	7	3	9	23	39	20	0	0
1991	1	2	2	42	36	17	0	0
1992	0	0	7	26	39	25	2	0
1993	0	3	5	27	29	25	10	0
1994	0	1	5	12	32	33	18	0
1995	0	0	5	14	27	37	12	5
1996	0	0	2	3	10	36	28	9
1997	0	0	0	3	15	41	30	11

Since synthetic fertilizers established their role in meeting production targets, breeders have responded in synthesizing cotton genotypes suitable for higher quantities. Tall-growing conventional types were prone to excessive doses of nitrogenous fertilizers and capped the upper limit of nitrogen quantity. Breeders were able to raise the upper growth limit and increase yields through the introduction of short stature genotypes. Such a process is prominent in wheat and rice, but can also be used for cotton and cotton breeders all over the world have made concerted efforts to develop short stature varieties, suitable for higher doses of fertilizers. Consequently, the use of fertilizers increased.

Weeds harbor insects and share inputs with the commercial crop, and must be removed in order to obtain optimal yields. If fields are not free of weeds, the benefits of using fertilizer and insecticides are reduced. Herbicides were found to be an economical solution to proper weed control. Currently, the quantity of herbicides used is more than double the quantity of insecticides used in the USA in terms of active ingredients. Herbicides are still not popular in some countries, but the US trend is also seen in Brazil, South Africa and many European countries where herbicides are used in manyfold quantities compared to insecticides.

According to the Pesticide Trust (1995), 10% of all agrochemicals are used on cotton as against 25% on all vegetables and 14% on cereals. Rice and maize are substantial consumers of agrochemicals, using about 13 and 11% of all agrochemicals, respectively. But, cotton remains the heaviest consumer of insecticides.

In many countries, especially where cotton is machine picked, herbicides, insecticides, growth regulators and harvest aid chemicals in addition to fertilizers are inte-

Global Agrochemical Use in 1994

By Area	**%**
North America	30
East Asia	28
West Europe	24
Latin America	9
East Europe	3
Rest of the World	5
By Product Type	
Herbicides	42
Insecticides	29
Fungicides	20
Others	10

gral parts of production practices. Even after harvesting, cotton fabric at textile mills is treated with a variety of chemicals for improving appearance and performance. Cotton fabrics are often processed with toxic dyes and formaldehydes before they reach end users.

Chemicals added to the cost of production and reduced cotton industry profitability during the 1980s, and cotton farmers in many countries started thinking of alternate means of growing cotton. Farmers also became concerned about the aggregate health effects of chemicals and considered switching to traditional, natural methods for controlling pests and weeds and for preparing cotton for harvesting. These methods, combined with modern technology, were applied to organic production to make it competitive with chemically grown cotton.

What is Organic Farming?

Growing cotton without synthetic fertilizers and other chemicals has been termed green, environment friendly, biodynamic, etc., but organic production is the most popular name used in the cotton industry. There is no accepted single definition for organic cotton, and there is not only one reason for going into organic production. Organic cotton production is a system of growing cotton without synthetic chemical fertilizers, herbicides, conventional synthetic insecticides, growth regulators, growth stimulators, boll openers or defoliants. It is a system that contributes to healthy soils and/or people. The organic system promotes enhanced biological activity, encourages sustainability and commands proactive management of production systems.

The use of synthetic pesticides and fertilizers is not very old in the history of agriculture. Until about 50 years ago, all farming was done with natural inputs like farm yard manure, weeding through cultivation, rotating crops to maintain fertility, etc. But modern organic farming is not returning to obsolete cultivation methods. Soils have become exhausted and pest pressure has increased to the extent that 50-year-old methods will not work. Organic farming is a farming system that relies on natural inputs only. Modern organic cotton production requires much more intensive and innovative management.

Reasons for Organic Production

Organic production is also a consumer driven initiative. But, producers quickly adopted organic production because initially it seemed to be a feasible proposition. There may be more reasons, but the combined effect of the following factors resulted in the initiation of organic cotton production.

- Concern for the environment – Fertilizers and all pre-emergence herbicides are applied to the soil, but all the chemicals are not taken up by the cotton plant. Some elements are released into the environment while others leach into the soil and also pollute water.
- Concern for family health – In many countries, particularly where insecticides are sprayed with back mounted sprayers, spray-men do not use protective equipment thus creating a danger of insecticide inhalation. In tractor mounted sprayers, wind drift can lead to inhalation.
- Secure long-term viability for their properties – Chemical control of insects, particularly when insecticides were introduced, was the cheapest and most efficient way. However, "cheapest" and "efficient" do not seem true characteristics anymore because of increases in the number of sprays required and insect resistance.
- Life style – Some people were interested in insecticide-free cotton apparel due to allergies.
- To reduce input prices – Insecticide use changed the insect complex in many countries. Some minor insects became major and certain new insects were introduced. Consequently, there was an increase in the consumption of insecticides. Some countries, particularly in Central America, had to abandon cotton production. In many countries, the cost of insecticides is the most important factor in determining the economics of cotton production.
- Conventional farming systems were not working – Because of the high cost of plant protection operations and resistance to insecticides, highly chemical intensive conventional production practices were not working, and farmers decided to get away from traditional farming.
- Possibility of price premiums – It was also assumed that organic products would fetch premium prices, thus enhancing farmers' income from cotton production.

Organic Cotton Area in the USA

Organic production was started at the same time in a number of countries, but commercial production was adopted first in the USA in 1990/91. A number of international environmental agencies became active in other countries and tried to introduce organic production without considering what growing conditions were feasible for organic production. Technically supervised and financially motivated programs were started in many developing countries, including countries where cotton yields were the world's lowest. While on the one hand low input use was a reason to sustain the current yield level, a further reduction was not affordable economically. It can rightly be claimed that organic production other than in the USA was all on an experimental basis.

Organic production and certification was started in the USA with three certifying agencies. The Texas Department of Agriculture had one of the most successful and popular programs.

Organic Cotton Area in the USA

Year	Area (ha)
1990	365
1991	1,330
1992	2,550
1993	5,020
1994	6,416
1995	9,965
1996	4,362
1997	3,662
1998 (Est.)	4,068

As organic cotton area started increasing, a number of other companies introduced their certification programs, most of them limited to US conditions. Quickly, a chain of producers, certifying companies, spinning and weaving mills, apparel manufacturers and retail sellers was established.

Organic Production

Organic cotton farming is not just the elimination of undesirable chemicals, but it is a complex system that results in a bale of cotton free of hazardous substances. Customer demand for organically grown cotton is not a residue-free issue. If conventionally grown cotton is tested for hazardous substances and found free of chemical residues, an organic label cannot be slapped on the bale. It is not only illegal: it entirely undermines the efforts of environmentalists. Environmentalists deserve credit for innovation by encouraging organic producers. Organic production has the characteristics discussed below.

- Conventional production relies heavily on synthetic fertilizers that permit cultivation of cotton on a variety of soils because nutrient needs can be met through the addition of various fertilizers. Organic cotton can only be grown on specially prepared land through green manuring/cover crops. A quick shift in area is not possible, and unlike conventional production organic cannot be grown on all types of soils.
- Certification from a recognized certifying agency is a must, unless there is high mutual confidence between the producer and the buyer. There is usually a cost associated with certification services. Full organic production requires completion of the transitional period, which is usually two years of production without prohibited chemicals.
- Microorganism activities in the soil must be maintained at a high level to sustain high soil fertility.
- As no conventional insecticide is permitted on organic production, there must be a heavy reliance on biological control. Though certain special substances are permitted on organic cotton, predator and parasite activities must be maximized through agronomic measures and suitable production systems.
- Agrochemicals pollute the environment including soil, water and air. Organic cotton is environmentally safe to produce.
- The cost of products permitted for application on an organic crop is usually lower than synthetic insecticides and fertilizers.
- Lower yields are expected in organic production. But how much lower depends greatly on each farmers' skills growing cotton without inorganic fertilizers and insecticides.
- The cost of production may be higher, particularly in countries like the USA, due to manual picking and non-chemical removal of weeds.
- In order to compensate for low yields and higher costs of production, organic cotton farmers need to receive premium prices.
- Demand is limited for organic cotton and there is no assured market.

Organic Certification

Today's pesticides are designed to persist for shorter periods in the environment and are less lethal than in the early days of calcium arsenate and DDT. The Bremen Cotton Exchange, Bremen, Germany, undertook a study of chemical residues on cotton including insecticides and defoliants. The studies were done in 1991, 1992, 1993, 1996 and in 1998. Samples of conventionally grown cotton from many countries with diverse production practices were collected and analyzed. Results indicated that no chemical was above the threshold level during any year.

The International Federation of Organic Agriculture Farming (IFOAM) at the First International Conference on Organic Cotton, held in Cairo, Egypt, from September 23-25, 1993, considered setting standards for pesticide residue on cotton. The idea was to set a standard and use it in the issuance of a certificate for organic products. As there are so many potential ways to misrepresent a bale of cotton as being organic, the recommendation was dropped from consideration. This is one of the reasons that third party certifying agencies stepped in from the very beginning of organic cotton production. The objective was to assure customers that organic cotton meets a minimum set of standards.

Although certification has become an integral part of organic production, organic cotton has been produced without formal certification at least in Brazil. An association of small producers in Fortaleza, Ceara, in the northeast of Brazil has been producing organic cotton for its customers thousands of kilometers away from the production area. Another example of self-certification is SEKEM Farms, a private enterprise in Egypt that has produced organic cotton and exported it to European countries, particularly Germany.

Some fundamental requirements of certification were discussed in the June 1994 issue of the *ICAC RECORDER*. In order to carry the organic condition through to the end product, it is necessary that not only production operations be organic but that subsequent operations also be certified as organic. Other segments of the organic cotton industry include certification of gins where the organic cotton is processed and the warehouses

where it is stored. All operations at the spinning and weaving mills also need to be certified to complete the chain.

Quantity of Organic Cotton Produced in the World

There is not a single agency keeping track of organic production in the world. Data in the table below have been collected from more than one source and do not reflect official statistics from any government.

Organic Cotton Production (tons)

Country	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98
Argentina	NA	NA	81	2	75	75	132	70
Australia	NA	NA	479	500	750	400	500	400
Benin								5
Brazil				2	8	1	5	5
Egypt			38	141	598	600	650	630
Greece					450	500	475	400
India			206	268	398	929	900	930
Israel						100	100	50
Mozambique						90	90	50
Nicaragua					16	20	20	20
Paraguay				100	75	50	50	50
Peru			400	700	924	1,516	1,500	650
Senegal						2	30	20
Tanzania				15	33	100	100	200
Turkey	5	60	120	198	610	720	750	800
Uganda				16	150	250	300	800
USA	330	820	2,155	4,274	5,365	7,425	3,396	2,852
Zambia						35	30	30
Zimbabwe						20	NA	5
Total			**3,479**	**6,216**	**9,452**	**12,833**	**9,028**	**7,967**

The table shows that organic cotton has been tried in at least 19 countries. Organic cotton production reached its peak in most countries in 1995/96, after cotton priced reached record levels. In the two seasons since 1995/96, organic cotton production has decreased in almost all countries except Tanzania and Uganda. There was also a slight increase in production in India and Turkey. In the USA, the largest producer of organic cotton in the world, organic production in 1997/98 was only one-third the level of 1995/96. During 1998/99, an estimated 4,062 hectares were planted under organic conditions in the USA, but only one-fourth may have been harvested. Thus, US organic cotton production will be significantly lower than in 1997/98 and may be less than 15% of production in 1995/96. The reasons for lower production in the USA in 1998/99 are the same as for conventional production, cool rainy weather in the West and dry weather in the Southwest. Organic production is also expected to be lower in most other countries in 1998/99.

Reasons for Reduction in Organic Production

The reasons for starting organic production, as mentioned above, are still valid and yet organic production is not increasing. Organic production started because there seemed to be a demand for it and it was hoped that the demand for organic products would increase. The following factors may have contributed to a reduction in organic cotton production area.

- For organic farmers who successfully raise a crop, the system seemed to be attractive. But the fact of the matter is that organic production was started without any systematic research. It was assumed that the elimination of synthetic insecticides and fertilizers would simplify production technology and that everyone interested in producing organic cotton would be able to do so. No systematic research was undertaken. Consequently, farmers failed to produce organic cotton economically, and some have quit.
- Because production started without any research, sufficient technical transfer of technology support was not available to organic producers.
- One of the significant factors in organic production is the suitability of varieties to organic conditions. It was assumed that all varieties were suitable for organic production. Thus, conventionally grown varieties in all countries were put to organic production, one of the reasons for low productivity. Under organic conditions, cotton must have the ability to resist insect pest pressure and maintain high yields without inorganic nitrogenous fertilizers.
- Under most conditions, cotton is grown as part of a production system. Due to high pressure to produce food crops, cropping intensity has increased to over 200% in many countries. Organic cotton production affects cropping intensity, thus affecting farm income.
- Organic production yields are expected to be lower than those in conventional production. The loss in yields can be related to the need for insecticides and fertilizers used under conventional production. If insect pressure is high, more loss is expected in the absence of insecticides. The loss in yield has been so high that it is not economical to produce organic cotton.
- The loss in yield could be offset by premium prices. Higher prices were expected, but organic farmers have not received sufficient premiums. Organic prices ranged from a discount, due to spots on account of insect attack, to premiums. Or-

ganic producers could not continue producing organic cotton at no/low premium.

- The lack of coordination among organic producers and consumers is also a factor for discouraging both segments of the industry.
- With the exceptions of Australia, Israel and the USA, in most countries organic production was started as a project by an international agency, and in some countries growers were compensated for the loss in yields. However, the end of foreign support resulted in termination of projects.

Despite past difficulties getting the organic industry off the ground, it cannot be concluded that organic production is not a feasible proposition. However, organic production may not be suitable for all types of production conditions in all countries. Perhaps many of the initial problems in starting a bona fide organic cotton industry can be placed on research and development costs, which had to be borne by pioneers in all sectors. Now, both the farming and manufacturing ends of the business have worked through many of these problems. Organic production definitely requires more skill and determination, compared to conventional production. Those farmers who have managed to hold on through this tumultuous start-up phase will be disappointed if proper systematic work is not undertaken for the development of a technology package and its dissemination to organic producers.

References

International Cotton Advisory Committee. 1996. World organic cotton production, *THE ICAC RECORDER*, Vol. XIV, No. 4, December 1996.

Organic Cotton Trade Association. 1998. *Organic Cotton Directory 1998-1999*, Organic Cotton Trade Association/Organic Fiber Council, P. O. Box 1078, Greenfield, MA 01302, USA.

Pesticides Application, on line Central Cotton Research Institute, Multan, Pakistan at <http://www.ccri.org.pk/>.

Technical Information Section. 1996. *Growing Organic Cotton*, International Cotton Advisory Committee, 1629 K Street, Suite 702, Washington, DC, USA, October 1996.

The Pesticide Trust. 1995. Global increase in pesticide use, *Pesticides News*, The Journal of the Pesticide Trust, Eurolink Centre, 49 Effra Road, London SW2 1BZ, UK, No. 28, June 1995.

The Cost of Producing Cotton

The Secretariat of the International Cotton Advisory Committee has undertaken surveys on the cost of cotton production since 1971. The data was updated irregularly, every one or two years at the beginning. But since 1983, reports on the cost of production have been published every three years, at the time of plenary meetings. The latest report was published in October 1998 and is based on data for the year 1997/98. For the sake of consistency, since 1992 the same questionnaire has been used to collect information from countries. In the report prepared for the 57th Plenary Meeting, held in Bolivia from October 12-16, 1998, data are available for 29 countries. Many countries provided data for various regions or sets of production practices, thus the total number of entries is 55.

Knowing that production practices differ greatly among countries, the questionnaire has been designed to accommodate wide variations in production systems and input costs. The data covers all operations from presowing to harvesting and ginning. It also includes economic and fixed costs.

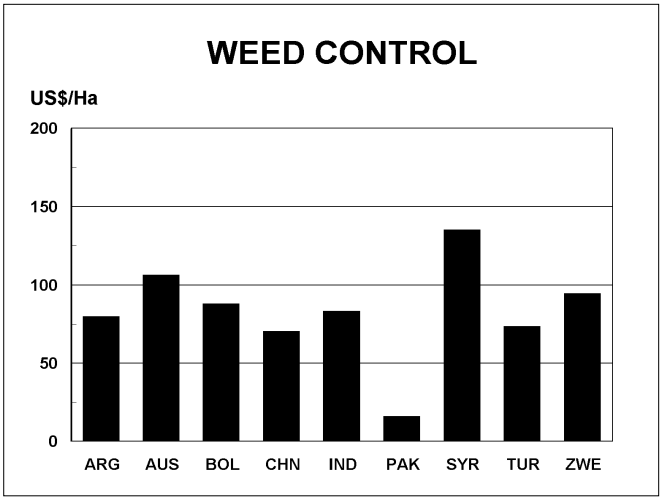
It is not possible to compare all countries and all entries in this paper, thus ten selected countries representing the major cotton producers and production regions are discussed in detail. The countries and the legends used in the charts are as follows:

Countries and Legends

Argentina (Santiago del Estero, irrigated)	ARG
Australia (New South Wales, irrigated)	AUS
Bolivia	BOL
China (Mainland)	CHN
India (Central South rainfed)	IND
Pakistan (Punjab)	PAK
Syria	SYR
Turkey (Çukurova Region)	TUR
USA (national average)	USA
Zimbabwe	ZWE

Weed Control

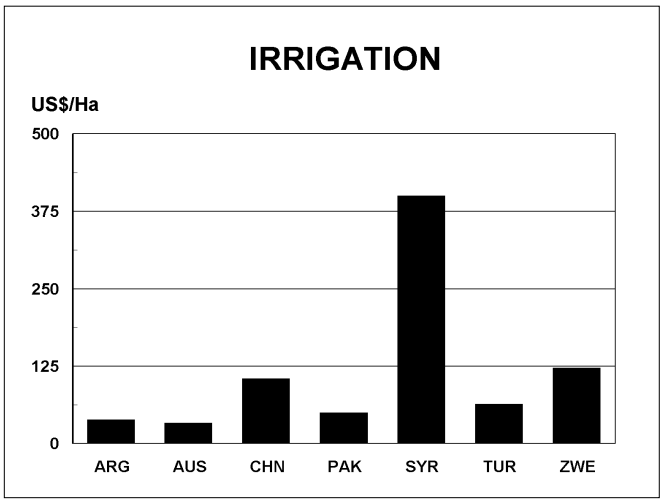
Weeds can be controlled manually, mechanically or chemically. Herbicides are used extensively in Colombia, Greece, Israel, Spain, Syria and the USA. In China, India and Pakistan herbi-



cides are still used on less than 10% of the total cotton area, and weeds are removed through cultivation or manually. The cost of weed control operations in the survey includes the cost of hoeing, weeding and herbicides and their application. The cost of the weed control operation is the highest in Syria, where a combination of herbicides plus mechanical operations cost US$135/ha. Weeds are removed mechanically in Pakistan, and the cost is the lowest among the ten countries mentioned. The cost is higher in India because of manual operations. In the USA, herbicides are applied on over 90% of the cotton area, but separate data are not available and their cost is included in chemicals under insecticides.

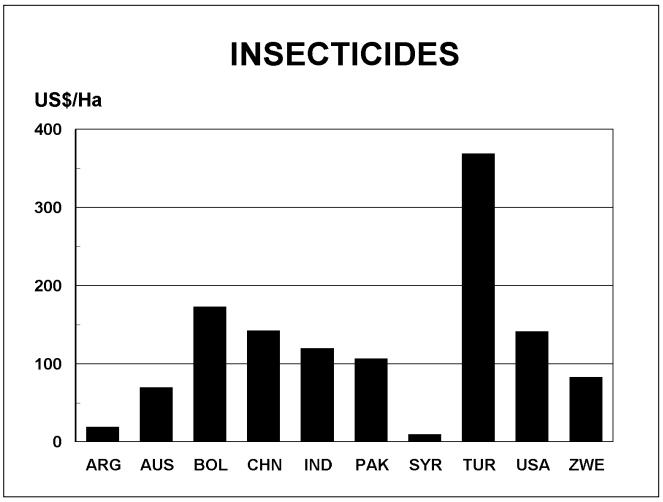
Irrigation

The cotton plant is not a water loving plant but requires a regular supply of water for optimum yields. However, only about 55% of world production comes from irrigated land. The remaining 45% is either partially irrigated or depends entirely on rain. Among the ten countries mentioned, irrigation is most expensive in Syria, which follows Israel among the 29 countries. In Israel, over US$500/ha is spent in irrigation water and drip and sprinkler irrigation systems. In Syria, though cotton is flood (69%) and furrow (25%) irrigated, the amount of water consumed in ten irrigations exceeds 7,500 cubic meters. In China (Mainland), almost all cotton is furrow irrigated and the cost of irrigation/ha is US$105. In Argentina, Australia, Pakistan and Turkey, water is almost free and only a nominal fee is charged.



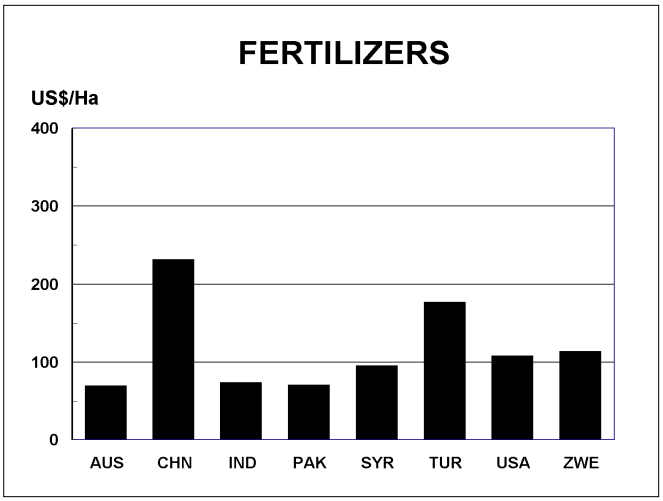
Insecticides

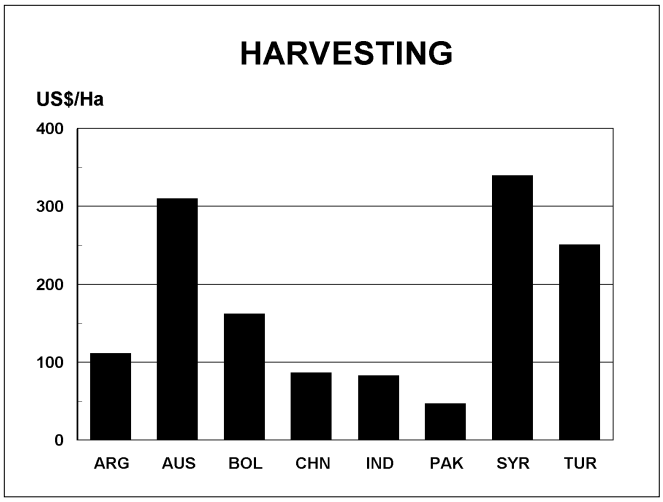
Insecticides have become an integral part of cotton production practices throughout the world. But the cost of insect control operations varies according to insect pressure. The need for insecticide use is minimal in Syria because of low insect pressure. Strict control by the Government of Syria of products and their use on cotton (only if absolutely required) has helped to build a strong natural biological control. The cost of insect control is low in Argentina because insecticide use is restricted to only a small percentage of the area. In most other countries, insect control is the highest among individual inputs in the cotton production system. The cost of insecticides is the highest in Turkey, followed by Australia, where the average number of sprays may exceed ten.

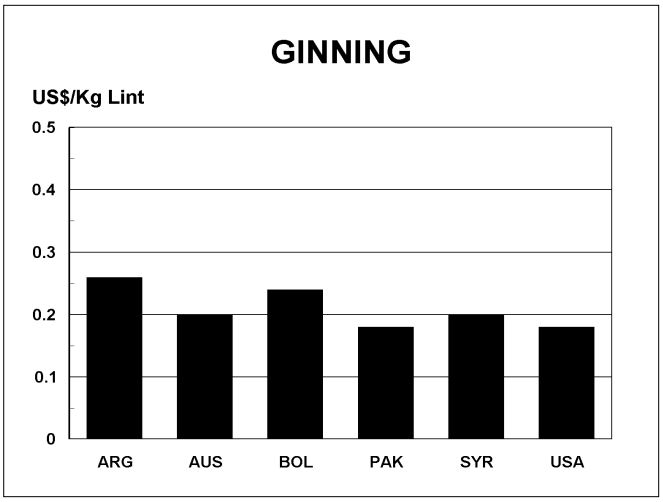


Fertilizers

Among the 29 countries who participated in the survey, cotton is generally grown without synthetic fertilizers in Argentina, Bolivia, some parts of Brazil and Uganda. Among the ten countries mentioned, there is high fertilizer use in China (Mainland), where an average of over US$200/ha is spent on fertilizers. In addition, because of intensive farming and easy availability, farmyard manure is regularly used; overgroth is avoided through topping. Fertilizer costs are close to US$180/ha in the Çukurova Region of Turkey. The cost is high in China and Turkey because of higher doses of nitrogenous fertilizers; phosphorous and potassium are rarely used in both countries.







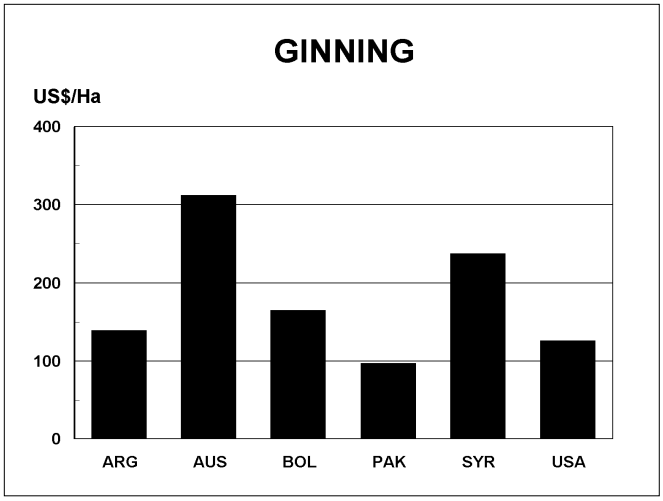
Harvesting

Cotton is machine picked only in a few countries. Among the ten countries listed above, cotton is 100% machine picked in Australia and the USA. The cost of picking cotton varies drastically among countries mainly due to differences in wages and the quantity of seedcotton. The cost of harvesting one hectare of cotton ranges from US$340 in Syria to only US$47 in Pakistan, though cotton is 100% hand picked in both countries. Though the yield in China is almost three times higher than in India, the cost of harvesting one hectare of cotton is almost equal in both countries. The cost is high in Australia and Syria because of higher yields. The cost of picking one hectare of cotton in the Çukurova Region of Turkey is US$251 because of a scarcity of labor. Machine picking may be introduced in this region of Turkey very soon.

Ginning

The cost of ginning includes the cost of transporting seedcotton to the gin, classing and grading charges, in addition to the cost of the ginning operation. In many countries, farmers sell their seedcotton to a middleman or directly to a gin and it is difficult to assess the cost of ginning, as custom ginning is not known. Differences in the cost of ginning per hectare are significant mainly because of the quantity of seedcotton produced per hectare. Among the ten countries mentioned, ginning is most expensive in Australia, i.e. US$312/ha against US$126/ha in the USA. In China, ginning is subsidized by the government and usually represents less than 5% of total production costs, against 26% in Australia. Data on the cost of ginning were not available from China, India, Turkey and Zimbabwe, as farmers sell their produce before it is ginned.

The cost of ginning a kilogram of lint in six out of the ten countries mentioned ranged from 18 cents/kg in Pakistan and the USA, to 26 cents/kg in Argentina, and 20 cents/kg in Australia and Syria in 1997/98.

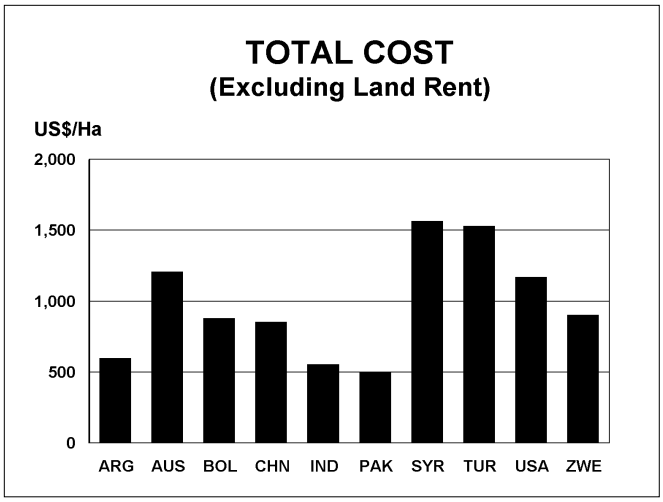


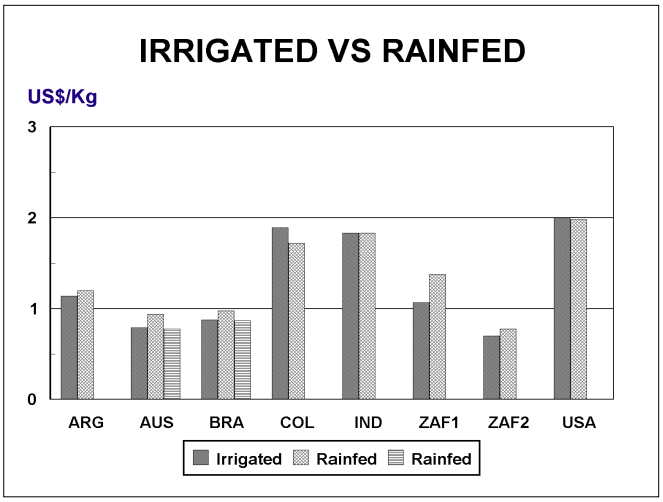
Total Cost

Data from the ten countries mentioned showed that over US$1,907 and US$1,805 is spent to produce one hectare of cotton in Syria and Turkey, respectively. This includes the cost of renting land for one year, which is US$240 in Syria and US$375 in the Çukurova Region of Turkey. No such data were available from Argentina, Australia, Bolivia, China (Mainland) and Zimbabwe. In the USA, though the cost of producing one hectare of cotton is almost US$2,400 in the Western Region, the national average, including land rent, is US$1,288/ha. In the USA, on average, farmers pay US$115 for growing cotton on one hectare.

For comparison purposes, land rent has been excluded from the total cost of producing one hectare of cotton. The total cost of producing one hectare of cotton is in the range of US$1,500 in Syria and Turkey and US$1,200 in Australia and the USA, and is comparable in Bolivia, China, India and Pakistan.

If the total cost/ha is high, it does not necessarily mean that the cost per unit of lint is also high. High yields in some countries



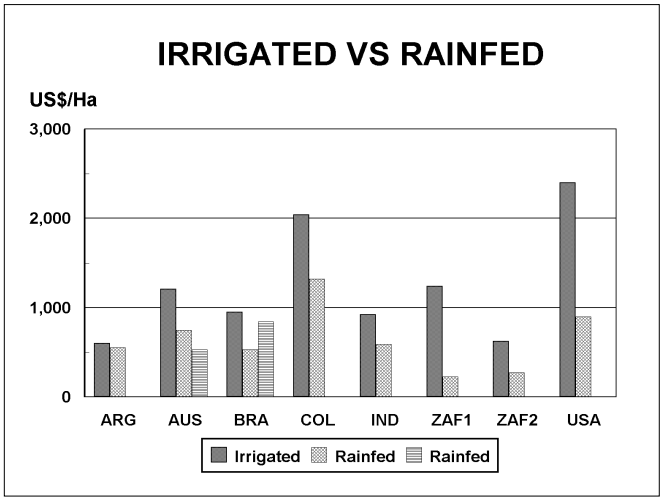


reduce the kg/lint cost and, in other countries, low yields increase it. The cost of producing one kilogram of lint, excluding land rent and the value of seed, is close to US$1.30 in Bolivia and Syria. Among the ten countries mentioned, it is least expensive to produce cotton in Australia and Pakistan: US$0.64 and US$0.65 kg/lint respectively. Complete data were not available from other countries.

Irrigated vs Rainfed Cost

Many countries grow cotton under irrigated and rainfed conditions at the same time. It was possible to compare the cost of irrigated versus rainfed cotton in seven countries.

Country	Irrigated Region	Rainfed Region
Argentina	Santiago del Estero	Chaco
Australia	New South Wales	Solid planting in the North-East Skip row in the North-West
Brazil	Northeast	Northeast Northeast-Cerrado
Colombia	South Cesar	Cauca Valley
India	Central South	Central South
South Africa	Mid-Transvaal	Mid Tranvaal (ZAF1)
	Northern Natal	Northern Natal (ZAF2)
USA	West	Southwest



The data show that the total cost of producing one hectare of cotton under irrigated conditions is high in all countries because additional expenditures are incurred, and the need for fertilizer and other operations also increases with the addition of irrigation water.

In most countries, the addition of irrigation water and other inputs that result in higher yields more than compensate for the additional cost incurred to grow cotton under irrigated conditions. Thus, higher yields under irrigated conditions result in lower cost per kg of lint, compared with rainfed cotton, except in Colombia. The cost of producing a kilogram of irrigated and rainfed cotton is almost the same in India and the USA, but higher yields under irrigated conditions will bring a higher income to the grower.

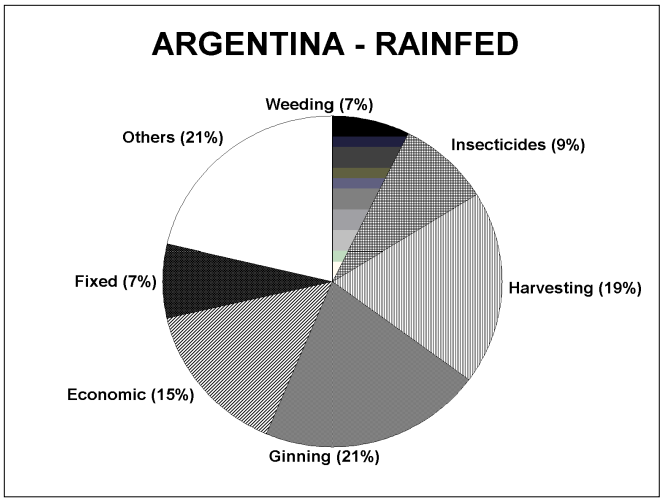
Cost Structure

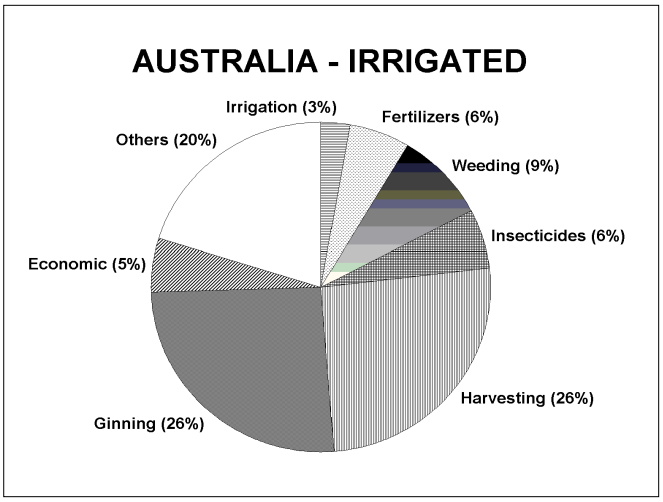
The cost of production under irrigated conditions in Australia and rainfed conditions in Argentina indicate that the cost of weed control and insecticides is less that 10% of the total cost of production. In Argentina, one-fifth of the total production cost is incurred in ginning. Ginning plus harvesting together represent 40% of the total cost in Argentina. The high harvesting and ginning share is because there are no irrigation and no fertilizer costs in the Chaco province.

In Australia, under irrigated conditions, ginning is one-fourth of total production costs. Ginning plus harvesting are over 50% of total costs. This is because of the quantity of seedcotton to be picked and ginned. Recently, insecticide costs have been contained in Australia through insecticide resistance management programs.

Limitations to Assessing Cost of Production

Cotton production systems vary greatly among countries, making inter-country comparisons extremely difficult. Although data are available for 29 countries, it is not possible to compare





them, as many countries have not provided data on all inputs. Land rent is a major cost in countries like Egypt, Iran, Spain, Syria and Turkey, but there is no system to rent land in other countries.

There are subsidies on production inputs in many countries; for instance, seed is supplied free of cost in some countries while other costs are monopolized by a lack of competition. Extension services are free in many countries, while in others farmers have to pay for the consultant. It is difficult to account for subsidies, special incentives and overcharging on some services.

Differences in production practices and local methods to assess cost of production also make inter-country comparisons extremely difficult. Comparisons among specific countries are more reliable than comparisons among many countries at the same time. However, it is more reliable to compare individual inputs.

In many countries, farmers sell their seedcotton, while in others they have it ginned, and lint and seed are still the property of the farmer. While in the former situation lint data are not available, in the latter seedcotton yield data are not available.

Economic and fixed costs are important components of the total cost of production. Economic costs include management and administration, interest on the capital invested, all repairs and general farm overhead. There are no systems to calculate such costs in many countries. The same is true for fixed facilities and their depreciation on the farm.

Short Notes

- **Cotton Production in the World**

  At the end of December, cotton will be at the early flowering stage in most countries of the Southern Hemisphere. The Southern Hemisphere will produce about 10% of the world total in 1998/99. Australia, Brazil and Argentina are the largest Southern Hemisphere producers accounting for an estimated 1.5 million tons, 8% of world production during 1998/99. During 1998/99, cotton-growing conditions in the Southern Hemisphere are normal and it is expected that total production will be 1.9 million tons.

  In the Northern Hemisphere, the USA has been affected the worst by continued rains and delayed planting in the West, particularly in California, and dry/hot weather in the Southwestern region. Over a million hectares of dryland planting in Texas was damaged by a lack of rain. The U.S. is expected to produce 2.9 million tons in 1998/99, as against 4.092 million tons produced in 1997/98. The 28% decline in production is due to a 22% reduction in harvested area, from 5.37 million hectares in 1997/98 to 4.20 in 1998/99. Even though about 45% of U.S. area is under Bt cotton varieties this season, the average cotton yield during 1998/99 in the USA will be about 700 kg/ha, 70 kg/ha lower than in 1997/98.

  In China (Mainland), cotton production continues to expand in the Northwest province of Xinjiang. In the East, some of the area taken out of production has returned to cotton because of resistance management programs. During 1998/99, cotton-growing conditions were almost normal in the Yellow River and Yangtze River Valleys until August, when 150,000 hectares were lost to floods along the Yangtze River, where transplanting of cotton is very common. Total production in China is estimated to be short by 7% over 1997/98, at 4.3 million tons in 1998 as against 4.6 millions in 1997/98. Cool weather at an early stage in Xinjiang, which has a comparatively short growing season, and losses due

to floods, are responsible for lower production in China (Mainland) during 1998/99.

The Northern region of India continues to be affected by the leaf curl virus disease and the cotton bollworm. But due to better growing conditions in the Central South and South regions, India is expected to produce 2.8 million tons in 1998/99, against 2.6 million tons in 1997/98.

In Pakistan, cotton production has been badly affected by the leaf curl virus disease since 1992/93. During 1998/99, the leaf curl virus was less severe due to a smaller whitefly population, which is a vector for the disease. But, high temperatures resulted in early bud/flower shedding which delayed boll formation by over two weeks. Consequently, the majority of the bolls were formed during the peak bollworm attack, thus increasing the losses due to bollworms. However, a 2% increase in area and less pressure from the leaf curl virus disease may partly compensate for the losses due to the cotton bollworm, and production is expected to be close to last year's 1.6 million tons.

Cotton production in Uzbekistan has declined since 1990. In spite of a 4% increase in area, Uzbekistan is expected to produce only one million tons of cotton during 1998/99, the lowest in decades. Low soil temperature and wet soil conditions normally limit early planting in Uzbekistan, thus squeezing the crop duration to a shorter season. In the last few years, the Government of Uzbekistan has tried planting cotton under plastic covering. While plastic can also conserve moisture, in Uzbekistan plastic is used to enhance soil temperature. It is estimated that over 400,000 hectares were planted under plastic during 1998/99, but the yield continues to be affected by a disturbance in the supply of inputs, and may be 645 kg/ha this season, as against 768 kg/ha in 1997/98.

The latest ICAC estimates suggest that total world production during 1998/99 will be 18.2 million tons from an area of 33.3 million hectares. Average yields in Pakistan are expected to be in the vicinity of last year's. In India, if the current estimates become true, average yield may be slightly higher than in 1997/98. However, lower yields in three of the five largest cotton producing countries of the world will lower the world average yield to 560 kg/ha as against 589 kg/ha in 1997/98.

Area, Production and Yield in Some Countries

Country	1997/98			1998/99 (Estimate)		
	Area 000 ha	Production 000 tons	Yield Kg/ha	Area 000 ha	Production 000 tons	Yield Kg/ha
Argentina	851	275	323	800	360	450
Australia	428	689	1,611	547	758	1,386
Brazil	925	370	400	841	400	476
China (Mainland)	4,530	4,602	1,016	4,230	4,300	1,016
Egypt	361	342	947	339	232	685
Greece	390	348	892	407	360	885
India	8,850	2,600	294	9,261	2,800	302
Pakistan	2,959	1,561	528	3,026	1,600	529
Syria	240	355	1,479	271	303	1,120
Turkey	722	832	1,152	731	802	1,097
USA	5,370	4,092	762	4,190	2,930	696
Uzbekistan	1,483	1,139	768	1,550	1,000	645
Others	6,675	2,700	404	7,101	2,355	332
World	33,784	19,905	589	33,294	18,200	560

• Systemic Induced Resistance

The best defense against any insect pest is the plant's own system to resist such attacks. But, there is a limitation to the extent of self-defense against most insects and diseases. Complete immunity to an insect attack or disease infestation is only possible if strong genes are available to be utilized in breeding without deleterious linkages. However, some of the fundamental work done in Australia has indicated that the plant's natural defense system could be boosted, particularly against pathogens. The process is called Systemic Induced Resistance and involves exposure of the plant to a locally infecting pathogen, a harmless form of a pathogen or some special chemicals.

Alternaria leaf spot, fusarium wilt and verticillium wilt are among the important diseases in Australia and may result in significant losses if susceptible varieties are grown and proper crop rotations are not followed. The Systemic Induced Resistance mechanism was tried to control alternaria leaf spot and bacterial blight in Pima cotton and verticillium and fusarium wilt in upland varieties through application of benzothiadiazole (BTH) treatment and silicic acid. In order to control alternaria leaf spot and bacterial blight, BTH and silicic acid were sprayed on the crop at the early flowering/bud stage, 60-75 days after planting. Losses due to the disease, measured in the treated and untreated plots after one month, showed that treated plots had two to fifteen times less alternaria lesions compared to untreated plots. The treated plots also had significantly lower blight damage and minimum defoliation.

The self-defense booting system against verticillium was checked on a susceptible upland variety planted in soil infested with the wilt pathogen. BTH and silicic acid were sprayed twice, once before any disease symptoms appeared and again about three months after planting. The results showed that application of BTH and silicic acid significantly reduced the disease severity. Resistance to fusarium wilt was assessed through two applications of BTH. The first application was given about one month after planting, when the disease was visible in the field and a substantial loss in plant stand had occurred. The second application was

done about 45 days after the first application. The effect of BTH was measured in the form of increase in plant height and vascular coloration in stem cutting. About 50 days after the second treatment, the results indicated that treated plants had higher plant height compared to untreated plants. 25% of the treated and disease-affected plants showed vascular browning as against 35% in disease-affected but untreated plants. Further studies are under way in the current season by spraying the chemical before disease symptoms appear in the field.

(Source: *The Australia cottongrower*, Volume 19, No. 4, 1998)

- **Enzyme and Hormone Changes: A Cause of Fruit Shedding**

All cotton varieties have a certain degree of fruit shedding. But, it is the flower buds and small bolls that are shed; open flowers are rarely shed if fertilized. Many factors like rain at the time of anther dehiscence and high temperatures affecting pollen germination and growth could be responsible for non-fertilization of flowers, but all unfertilized flowers are always shed. Thus flowers are largely shed due to external effects and not because of internal changes within the plant system. However, buds and small bolls are shed due to external factors like irradiance, insect attack, high temperature, water shortage, deficiency of inorganic nutrients, etc., in addition to changes in hormone and enzyme activities. It is difficult to establish how much shedding occurs on account of external and internal factors, but it is certain that changes in enzymes and hormones are one of the major causes for bud and small boll shedding.

Shedding occurs as a result of changes in the abscission zone at the base of the pedicel. Two enzymes, pectinase and cellulase, weaken the middle lamellae and cell walls respectively in the abscission zone. Any condition that is responsible for shedding must affect synthesis of one or both enzymes. Three hormones, auxin (Indole 3 acetic acid, IAA), ethylene and abscisic acid, are reported to have a significant effect on pectinase and cellulase. Auxin inhibits abscission if the concentration is higher in the distal than in the proximal cells of the abscission zone. IAA prevents an increase in the specific cellulose that causes abscission. Thus any factor that favors movement of auxin to the abscission zone helps to reduce shedding. Ethylene promotes the synthesis of pectinase and cellulase and thus stimulates formation of an abscission layer at a faster rate. Through oxidative decarboxylation, thylene also destroys IAA and helps to slow down the rate of movement of IAA to the abscission zone, another factor responsible for separation of bud or boll pedicel from the stem/branch. The abscisic acid may have some direct effect on abscission, but its indirect effect in the form of stimulation of ethylene formation is more prominent. Some other hormones like cytokinins and gibberellins are also reported to have some indirect effects on the formation of the abscission zone.

(Source: Causes of square and boll shedding, *Proceedings of the Beltwide Cotton Conferences*, 1998. National Cotton Council of America, Memphis, TN, USA.)

*****

A DIALOG Search of the CAB Abstracts Database on Nematodes

The keywords used in the search are **Cotton** and **Nematode**. According to the CAB Abstracts, a database maintained by CAB International of the UK, from 1995 to date, 74 papers related to nematodes were published in national and international journals.

03643278 CAB Accession Number: 981701365
Report of the Nematode Management Committee-1997: percent yield loss due to nematodes.
Mueller, J. D.
Clemson University, Blackville, SC, USA.
1998 Proceedings Beltwide Cotton Conferences, San Diego, California, USA, 5-9 January 1998. Volume 1.
Conference Title: 1998 Proceedings Beltwide Cotton Conferences, San Diego, California, USA, 5-9 January 1998. Volume 1, p.115
Publication Year: 1998
Editors: Dugger, P.; Richter, D.
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Annual report; Conference paper

03643276 CAB Accession Number: 981701363
Comparative reproduction of *Meloidogyne incognita* race 3 (cotton root-knot nematode) and *Rotylenchulus reniformis* (reniform nematode) on cotton, kenaf, and sunn hemp.
Robinson, A. F.; Cook, C. G.; Bridges, A. C.
USDA, ARS, College Station, TX, USA.
1998 Proceedings Beltwide Cotton Conferences, San Diego, California, USA, 5-9 January 1998. Volume 1.
Conference Title: 1998 Proceedings Beltwide Cotton Conferences, San Diego, California, USA, 5-9 January 1998. Volume 1, p.147-148
Publication Year: 1998
Editors: Dugger, P.; Richter, D.
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03643275 CAB Accession Number: 981701362
Evaluation of root-knot nematode management options in San Joaquin Valley cotton.
Goodell, P. B.; Eckert, J. W.; Roberts, P. A.
Cooperative Extension, University of California, Keanry Agricultural Center, Parlier, CA, USA.
1998 Proceedings Beltwide Cotton Conferences, San Diego, California, USA, 5-9 January 1998. Volume 1.
Conference Title: 1998 Proceedings Beltwide Cotton Conferences, San Diego, California, USA, 5-9 January 1998. Volume 1, p.143-145
Publication Year: 1998
Editors: Dugger, P.; Richter, D.
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03643274 CAB Accession Number: 981701361
Management of reniform nematode in cotton using various rotation schemes.
Gazaway, W. S.; Akridge, J. R.; Rodriguez-Kabana, R.
College of Agriculture, Auburn University, AL, USA.
1998 Proceedings Beltwide Cotton Conferences, San Diego, California, USA, 5-9 January 1998. Volume 1.
Conference Title: 1998 Proceedings Beltwide Cotton Conferences, San Diego, California, USA, 5-9 January 1998. Volume 1, p.141-142
Publication Year: 1998
Editors: Dugger, P.; Richter, D.
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03643272 CAB Accession Number: 981701359
Suppression of reniform and root-knot nematode with Temik and Vydate.
Lorenz, G. M.; Kirkpatrick, T.; Hope, A. R.; Rorie, K.; Fisher, A. U of A CES, Little Rock, AR, USA.
1998 Proceedings Beltwide Cotton Conferences, San Diego, California, USA, 5-9 January 1998. Volume 1.
Conference Title: 1998 Proceedings Beltwide Cotton Conferences, San Diego, California, USA, 5-9 January 1998. Volume 1, p.138-139
Publication Year: 1998
Editors: Dugger, P.; Richter, D.
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03643267 CAB Accession Number: 981701354
Reniform nematode and silver leaf whitefly influence on lint yield, fiber quality and seed quality of cotton .
Cook, C. G.; Robinson, A. F.
USDA, ARS, Weslaco and College Station, TX, USA.
1998 Proceedings Beltwide Cotton Conferences, San Diego, California, USA, 5-9 January 1998. Volume 1.
Conference Title: 1998 Proceedings Beltwide Cotton Conferences, San Diego, California, USA, 5-9 January 1998. Volume 1, p.171-172
Publication Year: 1998
Editors: Dugger, P.; Richter, D.
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03628463 CAB Accession Number: 981613719
Three root-knot nematode resistant germplasm lines of Upland cotton.
Starr, J. L.; Smith, C. W.
Department of Plant Pathology and Microbiology, Texas A&M University, College Station, TX 77840-2474, USA.
1998 Proceedings Beltwide Cotton Conferences, San Diego, California, USA, 5-9 January 1998. Volume 1.
Conference Title: 1998 Proceedings Beltwide Cotton Conferences, San Diego, California, USA, 5-9 January 1998. Volume 1, p.609
Publication Year: 1998
Editors: Dugger, P.; Richter, D.
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03582864 CAB Accession Number: 981700787
Nitrogen fertilization and nematode symptoms on cotton plant.
Original Title: A adubacaço nitrogenada e o sintoma de nematoides no algodoeiro.

Silva, N. M.; Fuzatto, M. G.; Kondo, J. I.; Sabino, J. C.; Pettinelli, A.; Gallo, P. B.
Instituto Agronomico (IAC), Caixa Postal 28, 13001-970 Campinas (SP.), Brazil.
Revista Brasileira de Ciencia do Solo, Vol. 21 (4): p.693-697
Publication Year: 1997
ISSN: 0100-0683
Language: Portuguese
Document Type: Journal article

03566032 CAB Accession Number: 981700705
Effect of soil application with certain nematicides on root-knot nematode (Meloidogyne incognita) infecting cotton (Gossypium hirsutum).
Chand, T.; Jain, R. K.
Department of Nematology, Haryana Agricultural University, Hisar-125 004, India.
Indian Journal of Nematology, Vol. 26 (1): p.112-115
Publication Year: 1996, publ. 1997
ISSN: 0303-6960
Language: English
Document Type: Journal article

03566011 CAB Accession Number: 981700684
Host preference of 6 geographical isolates of reniform nematode , *Rotylenchulus reniformis*.
Rao, G. M. V. P.; Ganguly, S.
Division of Nematology, Indian Agricultural Research Institute, New Delhi - 110 012, India.
Indian Journal of Nematology, Vol. 26 (1): p.19-22
Publication Year: 1996, publ. 1997
ISSN: 0303-6960
Language: English
Document Type: Journal article

03547892 CAB Accession Number: 981700466
The reniform nematode , an emerging problem in Arkansas cotton .
Kirkpatrick, T. L.; Lorenz, G.
University of Arkansas Southwest Research and Extension Center, Hope, Arkansas, USA.
Special Report - Agricultural Experiment Station, Division of Agriculture, University of Arkansas (No. 183): p.52-57
Publication Year: 1997
ISSN: 0571-0189
Publisher: University of Arkansas Publications, Fayetteville, USA
Language: English
Document Type: Journal article

03527076 CAB Accession Number: 981104139
Altered plant growth and maturity (in cotton) caused by Columbia lance nematode (Basirolaimus columbus).
Bond, C. R.; Lege, K. E.; Mueller, J. D.
Clemson University, Blackville, SC, USA.
1997 Proceedings Beltwide Cotton Conferences, New Orleans, LA, USA, January 6-10, 1997: Volume 2.
Conference Title: 1997 Proceedings Beltwide Cotton Conferences, New Orleans, LA, USA, January 6-10, 1997: Volume 2, p.1380
Publication Year: 1997
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03512657 CAB Accession Number: 981700283
Altered plant growth and maturity caused by Columbia lance nematode.
Bond, C. R.; Lege, K. E.; Mueller, J. D.
Clemson University, Edisto Research and Education Center, Blackville, SC, USA.
Conference Title: 1997 Proceedings Beltwide Cotton Conferences, New Orleans, LA, USA, January 6-10, 1997: Volume 2,
1997 Proceedings Beltwide Cotton Conferences, New Orleans, LA, USA, January 6-10, 1997: Volume 2, p.1380
Publication Year: 1997
Editors: Dugger, P.; Richter, D. A.
Language: English
Document Type: Conference paper; Journal article

03512648 CAB Accession Number: 981700274
Suppression of plant parasitic nematodes in cotton using the entomopathogenic nematode *Steinernema riobravis* (Cabanillas, Poinar, and Raulston) (Rhabditida: Steinernematidae).
Gouge, D. H.; Lee, L. L.; Van Berkum, J. R.; Henneberry, T. J.; Smith, K. A.
USDA-ARS, Western Cotton Research Laboratory, Columbia, MD, USA.
1997 Proceedings Beltwide Cotton Conferences, New Orleans, LA, USA, January 6-10, 1997: Volume 2.
Conference Title: 1997 Proceedings Beltwide Cotton Conferences, New Orleans, LA, USA, January 6-10, 1997: Volume 2, p.1324-1326
Publication Year: 1997
Editors: Dugger, P.; Richter, D. A.
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03490922 CAB Accession Number: 981102403
Effects of the reniform nematode and silverleaf whitefly on cotton.
Cook C. G.; Robinson, A. F.; Namken, L. N.; Wolfenbarger, D. A.
USDA-ARS, Weslaco, TX, USA.
1997 Proceedings Beltwide Cotton Conferences, New Orleans, LA, USA, January 6-10, 1997: Volume 1.
Conference Title: 1997 Proceedings Beltwide Cotton Conferences, New Orleans, LA, USA, January 6-10, 1997: Volume 1, p.444-445
Publication Year: 1997
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03463926 CAB Accession Number: 971701433
The performance of several commercial cotton cultivars over three years in a reniform nematode infested field.
Lorenz, G.; Kirkpatrick, T.; Robbins, R. T.
Cooperative Extension Service, University of Little Rock, AR, USA.
1997 Proceedings Beltwide Cotton Conferences, New Orleans, LA, USA, January 6-10, 1997: Volume 1.
Conference Title: 1997 Proceedings Beltwide Cotton Conferences, New Orleans, LA, USA, January 6-10, 1997: Volume 1, p.103
Publication Year: 1997
Language: English
Document Type: Conference paper

03463919 CAB Accession Number: 971701426
Impact of at-plant and post-plant nematicides on cotton production in reniform nematode infested fields.
Burmester, C.; Gazaway, W.; Potter, D. J.; Derrick, D.; Ingram, E.
Tennessee Valley Exp. Station, Belle Mina, AL, USA.
1997 Proceedings Beltwide Cotton Conferences, New Orleans, LA, USA, January 6-10, 1997: Volume 1.

Conference Title: 1997 Proceedings Beltwide Cotton Conferences, New Orleans, LA, USA, January 6-10, 1997: Volume 1, p.94-96
Publication Year: 1997
Language: English
Document Type: Conference paper

03463918 CAB Accession Number: 971701425
Efficacy of foliar application of Vydate C-LV for supplemental nematode control in cotton.
Kirkpatrick, T. L.; Lorenz, G.; Robbins, R. T.
University of Arkansas Southwest Research and Extension Center, Hope, AR, USA.
1997 Proceedings Beltwide Cotton Conferences, New Orleans, LA, USA, January 6-10, 1997: Volume 1.
Conference Title: 1997 Proceedings Beltwide Cotton Conferences, New Orleans, LA, USA, January 6-10, 1997: Volume 1, p.94
Publication Year: 1997
Language: English
Document Type: Conference paper

03463917 CAB Accession Number: 971701424
Reniform nematode and its influence on the cotton industry in the United States.
Overstreet, C.; McGawley, E. C.
LSU Ag Center, Baton Rouge, LA, USA.
1997 Proceedings Beltwide Cotton Conferences, New Orleans, LA, USA, January 6-10, 1997: Volume 1.
Conference Title: 1997 Proceedings Beltwide Cotton Conferences, New Orleans, LA, USA, January 6-10, 1997: Volume 1, p.92-94
Publication Year: 1997
Language: English
Document Type: Conference paper

03463821 CAB Accession Number: 971612539
Registration of N220-1-91, N222-1-91, N320-2-91, and N419-1-91 nematode -resistant cotton germplasm lines.
Cook, C. G.; Namken, L. N.; Robinson, A. F.
USDA-ARS Conserv. and Prod. Res. Unit, 2413 Hwy. 83, Weslaco, TX 78596, USA.
Crop Science, Vol. 37 (3): p.1028-1029
Publication Year: 1997
ISSN: 0011-183X
Language: English
Document Type: Journal article

03460779 CAB Accession Number: 971007676
Influence of nematicide application on the severity of the root-knot nematode -Fusarium wilt disease complex in cotton.
Colyer, P. D.; Kirkpatrick, T. L.; Caldwell, W. D.; Vernon, P. R.
Louisiana Agricultural Experiment Station, Red River Research Station, P.O. Box 8550, Bossier City 71113-8550, USA.
Plant Disease, Vol. 81 (1): p.66-70
Publication Year: 1997
ISSN: 0191-2917
Language: English
Document Type: Journal article

03451802 CAB Accession Number: 971701305
Crop-induced morphobiometrical variability in reniform nematode, *Rotylenchulus reniformis*. II. Young females, males and juveniles.
Sudershan Ganguly; Ramesh, V.
Division of Nematology, Indian Agricultural Research Institue, New Delhi 110 012, India.
Annals of Plant Protection Sciences, Vol. 5 (1): p.75-89
Publication Year: 1997
ISSN: 0971-3573
Language: English
Document Type: Journal article

03435101 CAB Accession Number: 971701148
Evaluation of cotton rotation for production in a nematode -infested field in Egypt.
Abd Elgawad, M. M.; Ismail, A. E.; El-Metwally, E. A.
Plant Pathology Department, National Research Centre, Dokki, Giza, Egypt.
International Journal of Nematology, Vol. 7 (1): p.103-106
Publication Year: 1997
Language: English
Document Type: Journal article

03435045 CAB Accession Number: 971610535
Root-knot nematode resistance of F_2 cotton hybrids from crosses of resistant germplasm and commercial cultivars.
Robinson, M.; Jenkins, J. N.; McCarty, J. C., Jr.
Department of Plant and Soil Sciences, Mississippi State University, Box 9555, Mississippi State, MS 39762, USA.
Crop Science, Vol. 37 (4): p.1041-1046
Publication Year: 1997
ISSN: 0011-183X
Language: English
Document Type: Journal article

03417795 CAB Accession Number: 971608753
Enhancement of cotton germplasm resistant to reniform nematode .
Stewart, J. M.; Robbins, R. T.
Agronomy Department, University of Arkansas, Fayetteville, Arkansas, USA.
Special Report - Agricultural Experiment Station, Division of Agriculture, University of Arkansas (No. 178): p.20-22
Publication Year: 1996
ISSN: 0571-0189
Language: English
Document Type: Journal article

03404998 CAB Accession Number: 971700936
Reniform nematode suppression in southeast Arkansas with nematicides.
Lorenz, G.; Kirkpatrick, T.; Vangilder, D.; Robbins, R.
University of Arkansas, Hope, Arkansas, USA.
1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1.
Conference Title: 1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1, p.254
Publication Year: 1996
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03393021 CAB Accession Number: 971700842
The effects of K fertilization on reniform nematode damage to cotton.
Mitchell, C. C.; Gazaway, W. S.
Alabama Cooperative Extension Service, Alabama Agricultural Experiment Station, Auburn University, AL, USA.
1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 2.
Conference Title: 1996 Proceedings Beltwide Cotton Conferences,

Nashville, TN, USA, January 9-12, 1996: Volume 2, p.1430-1432
Publication Year: 1996
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03367048 CAB Accession Number: 971700565
Incidence of Fusarium wilt/root-knot nematode complex among eight cotton varieties treated with and without a nematicide.
Colyer, P. D.; Kirkpatrick, T. L.; Caldwell, W. D.; Vernon, P. R.; Bateman, T.; Griffin, R. C.; Dickson, J. I.
Louisiana Agricultural Experiment Station, REd River Research Station, Bossier City, Louisiana, USA.
1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1.
Conference Title: 1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1, p.260
Publication Year: 1996
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03367047 CAB Accession Number: 971700564
Grower-agent perceptions of nematode management.
Mueller, J.; Starr, J.; Baird, R.; Kirkpatrick, T.
Clemson University, Blackville, South Carolina, USA.
1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1.
Conference Title: 1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1, p.260
Publication Year: 1996
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03367046 CAB Accession Number: 971700563
Effect of reniform nematode on plant growth and yield.
Mueller, J.; Davis, C.; Lege, K.
Clemson University, Edisto Research and Education Center, Blackville, South Carolina, USA.
1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1.
Conference Title: 1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1, p.259-260
Publication Year: 1996
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03367045 CAB Accession Number: 971700562
Effect of Columbia lance nematode on plant growth and fruit set.
Mueller, J.; Lege, L.; May, L.
Clemson University USDA, Blackville, South Carolina, USA.
1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1.
Conference Title: 1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1, p.259
Publication Year: 1996
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03367044 CAB Accession Number: 971700561
Vydate at C-LV foliar applications for management of reniform nematode in the southern U.S.
Hammes, G. G.; Mitchell, W. H.
E. I. DuPont, Hawkinsville, Georgia, USA.
1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1.
Conference Title: 1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1, p.254-255
Publication Year: 1996
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03366984 CAB Accession Number: 971700501
Sources of resistance to the reniform nematode *Rotylenchulus reniformis* Linford & Oliveira, 1940.
Original Title: Fontes de resistencia ao nematoide reniforme Rotylenchulus reniformis Linford & Oliveira, 1940.
Pipolo, V. C.
Departamento de Agronomia da Universidade Estadual he Londrina, Caixa Postal 6001, CEP 86051-970, Londrina, PR, Brazil.
Semina (Londrina), Vol. 15 (1): p.100-103
Publication Year: 1994
ISSN: 0101-3742
Language: Portuguese Summary Language: English

03341605 CAB Accession Number: 971700234
Root knot nematode management with different rates of aldicarb at planting.
Munier, D. J.; Goodell, P. B.; Eckert, J. W.
University of California Cooperative Extension, CA, USA.
1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1.
Conference Title: 1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1, p.257-258
Publication Year: 1996
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03341603 CAB Accession Number: 971700232
Reniform nematode and cotton production in Mississippi.
Lawrence, G. W.; McLean, K. S.
Department of Entomology, Mississippi State University, Mississippi State, MS, USA.
1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1.
Conference Title: 1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1, p.251-253
Publication Year: 1996
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03341601 CAB Accession Number: 971700230
Effect of soil potassium on reniform nematode damage in cotton.
Gazaway, W.; Mitchell, C.; Rodriguez-Kabana, R.
Department of Plant Pathology, Alabama Cooperative Extension System, Auburn University, AL, USA.
1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1.
Conference Title: 1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1, p.247-249

Publication Year: 1996
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03341600 CAB Accession Number: 971700229
Effect of rotation on reniform nematode control in cotton.
Rush, D. E.; Gazaway, W. S.
Pine Land Company, Brewton, AL, USA.
1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1.
Conference Title: 1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1, p.247
Publication Year: 1996
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03341598 CAB Accession Number: 971700227
The relationship between root-knot nematode and growth of cotton.
Wheeler, T. A.; Hake, K.; Stair, K.; Kaufman, H. W.
Texas A&M University, Lubbock, TX, USA.
1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1.
Conference Title: 1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1, p.280-282
Publication Year: 1996
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03338926 CAB Accession Number: 971102036
Control of pink bollworm *Pectinophora gossypiella* (Saunders) (Lepidoptera: Gelechiidae) larvae in Arizona and Texas cotton fields using the entomopathogenic nematode *Steinernema riobravis* (Carbanillas, Poinar, and Raulston) (Rhabditida: Steinernematidae).
Gouge, D. H.; Reaves, L. L.; Stoltman, M. M.; Berkum, J. R. van; Burke, R. A.; Forlow-Jech, L. J.; Henneberry, T. J.
USDA-ARS, Western Cotton Research Laboratory, Phoenix, AZ, USA.
1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 2.
Conference Title: 1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 2, p.1078-1082
Publication Year: 1996
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03329455 CAB Accession Number: 971700184
Management of the reniform nematode with Temik 15G using two application techniques, 1993.
Lawrence, G. W.; McLean, K. S.
Department of Entomology and Plant Pathology, Mississippi State University, MS 39762, USA.
Fungicide and Nematicide Tests, Vol. 51, p.183
Publication Year: 1996
ISSN: 0148-9038
Language: English
Document Type: Journal article

03329454 CAB Accession Number: 971700183
Reniform nematode management on cotton with fosthiazate, 1993.
Lawrence, G. W.; McLean, K. S.
Department of Entomology and Plant Pathology, Mississippi State University, MS 39762, USA.
Fungicide and Nematicide Tests, Vol. 51, p.182
Publication Year: 1996
ISSN: 0148-9038
Language: English
Document Type: Journal article

03329453 CAB Accession Number: 971700182
Management of reniform nematode on cotton with SM-9 and Temik 15G, 1993.
Lawrence, G. W.; McLean, K. S.
Department of Entomology and Plant Pathology, Mississippi State University, MS 39762, USA.
Fungicide and Nematicide Tests, Vol. 51, p.181
Publication Year: 1996
ISSN: 0148-9038
Language: English
Document Type: Journal article

03329452 CAB Accession Number: 971700181
Evaluation of SM-9 on reniform nematode management, 1993.
Lawrence, G. W.; McLean, K. S.
Department of Entomology and Plant Pathology, Mississippi State university, MS 39762, USA.
Fungicide and Nematicide Tests, Vol. 51, p.179
Publication Year: 1996
ISSN: 0148-9038
Language: English
Document Type: Journal article

03329451 CAB Accession Number: 971700180
Reniform nematode loss study on cotton in Alabama, 1995.
Gazaway, W.
Deppartment of Plant Pathology, Dru Rush, Alabama Cooperative Extension Service, Auburn University, AL 36849-5409, USA.
Fungicide and Nematicide Tests, Vol. 51, p.178
Publication Year: 1996
ISSN: 0148-9038
Language: English
Document Type: Journal article

03329450 CAB Accession Number: 971700179
Effect of post-plant nematicides on reniform nematode control in cotton, 1995.
Gazaway, W.; Burmester, C.
Department of Plant Pathology, Alabama Cooperative Extension Service, Auburn University, AL 36849-5409, USA.
Fungicide and Nematicide Tests, Vol. 51, p.177
Publication Year: 1996
ISSN: 0148-9038
Language: English
Document Type: Journal article

03329449 CAB Accession Number: 971700178
Effects of nematicides on reniform nematode on cotton, 1995.
Baird, R. E.; McDaniel, R. G.
RDC, Plant Pathology Department, PO Box 1209, Tifton, GA 31793, USA.
Fungicide and Nematicide Tests, Vol. 51, p.176
Publication Year: 1996
ISSN: 0148-9038
Language: English
Document Type: Journal article

03329448 CAB Accession Number: 971700177

Effects of nematicides on lance nematode on cotton, 1995.
Baird, R. E.; Crawford, J. L.; Davis, R. F.; Brewer, C. L.
RDC, Plant Pathology Department, PO Box 1209, Tifton, GA 31793, USA.
Fungicide and Nematicide Tests, Vol. 51, p.175
Publication Year: 1996
ISSN: 0148-9038
Language: English
Document Type: Journal article

03329447 CAB Accession Number: 971700176
Effects of select nematicides on reniform nematode, 1995.
Baird, R. E.
Plant Pathology Department, RDC, PO Box 1209, Tifton, GA 31793, USA.
Fungicide and Nematicide Tests, Vol. 51, p.174
Publication Year: 1996
ISSN: 0148-9038
Language: English
Document Type: Journal article

03318097 CAB Accession Number: 971600726
Cotton variety tests for disease and root-knot nematode tolerance.
Garber, R. H.; Oakley, S. R.
California Planting Cotton Seed Distributors, Shafter, CA, USA.
1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1.
Conference Title: 1996 Proceedings Beltwide Cotton Conferences, Nashville, TN, USA, January 9-12, 1996: Volume 1, p.255-257
Publication Year: 1996
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03306318 CAB Accession Number: 961701348
Effect of reniform nematode on cotton .
Lawrence, G. W.; McLean, K. S.
Department of Entomology and Plant Pathology, Mississippi State University, Mississippi, USA.
1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1.
Conference Title: 1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1, p.209-211
Publication Year: 1995
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03306312 CAB Accession Number: 961701342
Reniform nematode control with nematicides.
Lorenz, G.; Kirkpatrick, T.; Vangilder, D.; Robbins, R. T.; Barham, J. D.
Cooperative Extension Service, Little Rock, Arkansas, USA.
Special Report - Agricultural Experiment Station, Division of Agriculture, University of Arkansas (No. 172): p.143-146
Publication Year: 1995
ISSN: 0571-0189
Publisher: University of Arkansas Publications, Fayetteville , USA
Language: English
Document Type: Journal article

03306275 CAB Accession Number: 961701305
The interaction between Thielaviopsis basicola (black root rot) and the root-knot nematode .
Kirkpatrick, T. L.; Rothrock, C. S.
Southwest Research and Extension Center, Hope, Arkansas, USA.
Special Report - Agricultural Experiment Station, Division of Agriculture, University of Arkansas (No. 172): p.53-57
Publication Year: 1995
ISSN: 0571-0189
Publisher: University of Arkansas Publications, Fayetteville , USA
Language: English
Document Type: Journal article

03306263 CAB Accession Number: 961701293
Effect of root-knot nematode on Fusarium wilt resistance mechanism of cotton .
Mousa, E.-S. M.
Department of Agricultural Botany, Faculty of Agriculture, Menoufiya University, Shebin El-Kom, Egypt.
Proceedings of the Second Afro-Asian Nematology Symposium held at Menoufiya, Egypt, 18-22 December, 1995.
Conference Title: Proceedings of the Second Afro-Asian Nematology Symposium held at Menoufiya, Egypt, 18-22
December, 1995. p.88-92
Publication Year: 1995
Editors: Mousa, E-S. M.
Publisher: Menoufiya University Shebin El-Kom , Egypt
Language: English
Document Type: Conference paper

03306247 CAB Accession Number: 961701277
Evaluation of cultivars/lines of cotton for resistance against root-knot nematode, *Meloidogyne incognita*.
Pankaj; Sirohi, A.; Ganguly, A. K.
Division of Nematology, Indian Agricultural Research Institute, New Delhi-110012, India.
Annals of Plant Protection Sciences, Vol. 4 (1): p.85-94
Publication Year: 1996
ISSN: 0971-3573
Language: English
Document Type: Journal article

03282292 CAB Accession Number: 961609933
Registration of nine cotton germplasm lines resistant to root-knot nematode.
Shepherd, R. L.; McCarty, J. C. Jr.; Jenkins, J. N.; Parrott, W. L.
USDA-ARS, Crop Science Research Laboratory, PO Box 5367, Mississippi State, MS 39762, USA.
Crop Science, Vol. 36 (3): p.820
Publication Year: 1996
ISSN: 0011-183X
Language: English
Document Type: Journal article

03267808 CAB Accession Number: 961700920
Pathogenicity of spiral nematode *Helicotylenchus pseudorobustus* and the fusarium wilt disease complex on cotton seedlings.
Ma, C. Z.; Zhang, J. Q.; Qian, Z. U.
Institute of Plant Protection, Shanghai Academy of Agricultural Sciences, Shanghai 201106, China.
Acta Phytopathologica Sinica, Vol. 24 (2): p.153-157
Publication Year: 1994
ISSN: 0412-0914
Language: Chinese Summary Language: English
Document Type: Journal article

03230427 CAB Accession Number: 961700633
Reniform nematode management on cotton with fosthiazate, 1992.
Lawrence, G. W.; McLean, K. S.
Department of Entomology and Plant Pathology, Mississippi State University, Mississippi State, MS 39762, USA.
Fungicide and Nematicide Tests, Vol. 50, p.197-198
Publication Year: 1995
ISSN: 0148-9038
Language: English
Document Type: Journal article

03230426 CAB Accession Number: 961700632
Management of the reniform nematode on cotton with SM-9 and Temik, 1992.
Lawrence, G. W.; McLean, K. S.
Department of Entomology and Plant Pathology, Mississippi State University, Mississippi State, MS 39762, USA.
Fungicide and Nematicide Tests, Vol. 50, p.195-196
Publication Year: 1995
ISSN: 0148-9038
Language: English
Document Type: Journal article

03230425 CAB Accession Number: 961700631
Reniform nematode management on cotton with Nemacur, 1992.
Lawrence, G. W.; McLean, K. S.
Department of Entomology and Plant Pathology, Mississippi State University, Mississippi State, MS 39762, USA.
Fungicide and Nematicide Tests, Vol. 50, p.193-194
Publication Year: 1995
ISSN: 0148-9038
Language: English
Document Type: Journal article

03230424 CAB Accession Number: 961700630
Management of the reniform nematode on cotton with Temik, 1992.
Lawrence, G. W.; McLean, K. S.
Department of Entomology and Plant Pathology, Mississippi State University, Mississippi State, MS 39762, USA.
Fungicide and Nematicide Tests, Vol. 50, p.191-192
Publication Year: 1995
ISSN: 0148-9038
Language: English
Document Type: Journal article

03230423 CAB Accession Number: 961700629
Reniform nematode loss study in cotton, 1994.
Gazaway, W. S.
Department of Plant Pathology, Dru Rush, Alabama Cooperative Extension Service, Auburn University, AL 36849-5624,USA.
Fungicide and Nematicide Tests, Vol. 50, p.190
Publication Year: 1995
ISSN: 0148-9038
Language: English
Document Type: Journal article

03230422 CAB Accession Number: 961700628
Effects of nematicides on lance nematode in cotton , 1994.
Baird, R. E.; Crawford, J. L.; Brewer, C. L.
Rural Development Center, P.O. Box 1209, Tifton, GA 31794, USA.
Fungicide and Nematicide Tests, Vol. 50, p.189
Publication Year: 1995
ISSN: 0148-9038
Language: English
Document Type: Journal article

03230374 CAB Accession Number: 961700580
Evaluation of F2 hybrids between nematode resistant germplasm and cultivars.
Robinson, M. R.; Jenkins, J. N.; McCarty, J. C.
Mississippi State University, Mississippi State, USA.
1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1.
Conference Title: 1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1, p.536
Publication Year: 1995
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03230373 CAB Accession Number: 961700579
Progress in breeding for tolerance to the reniform nematode .
Cook, C.; Namken, N.; Robinson, F.
USDA-ARS and Texas Agricultural Experimental Station, Weslaco, Texas, USA.
1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1.
Conference Title: 1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1, p.535-536
Publication Year: 1995
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03230370 CAB Accession Number: 961700576
Efficacy of nematicides for Columbia lance nematode control.
Mueller, J. D.
Clemson University, Edisto Research and Education Center, Blackville, South Carolina, USA.
1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1.
Conference Title: 1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1, p.212
Publication Year: 1995
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03230366 CAB Accession Number: 961700572
Reniform nematode loss study in cotton production in Alabama.
Gazaway, W. S.; Rush, D. E.
Alabama Cooperative Extension Service, Auburn University, Alabama, USA.
1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1.
Conference Title: 1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1, p.209
Publication Year: 1995
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03230364 CAB Accession Number: 961700570
Nematode workshop Mid-South management.
Overstreet, C.
LSU Agricultural Center, Baton Rouge, Louisiana, USA.

1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1.
Conference Title: 1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1, p.200
Publication Year: 1995
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03230363 CAB Accession Number: 961700569
Nematode management in the southeast.
Baird, R. E.; Gazaway, W. S.; Mueller, J. D.
University of Georgia, Tifton, Georgia, USA.
1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1.
Conference Title: 1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1, p.199-200
Publication Year: 1995
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03230361 CAB Accession Number: 961700567
Symptoms of nematode damage and cotton cultivar.
Hartman, K. M.; May, O. L.
Jacob Hartz Seed Co., Florence, South Carolina, USA.
1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1.
Conference Title: 1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1, p.198-199
Publication Year: 1995
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03230360 CAB Accession Number: 961700566
Nematode samples and thresholds.
Mueller, J. D.; Goodell, P. B.
Clemson University and Cooperative Extension, Blackville, South Carolina, USA.
1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1.
Conference Title: 1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1, p.198
Publication Year: 1995
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03230359 CAB Accession Number: 961700565
What is a nematode ?
Robinson, A. F.; Starr, J. L.; Robbins, R. T.
USDA-ARS, College Station, Texas, USA.
1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1.
Conference Title: 1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1, p.196-198
Publication Year: 1995
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03230357 CAB Accession Number: 961700563
CPCSD Acala C-225: a new nematode resistance Acala variety for California's San Joaquin Valley.
Oakley, S. R.
California Planting Cotton Seed Distributors, Shafter, California, USA.
1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1.
Conference Title: 1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1, p.39
Publication Year: 1995
Publisher: National Cotton Council, Memphis, USA
Language: English

Document Type: Conference paper
03186174 CAB Accession Number: 960702400
The reaction of selected cotton varieties against reniform nematode .
Overstreet, C.; McGawley, E. C.
LSU Agricultural Center, Baton Rouge, Louisiana, USA.
1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1.
Conference Title: 1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1, p.213-214
Publication Year: 1995
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper

03186173 CAB Accession Number: 960702399
Effect of the reniform nematode on cotton.
Lawrence, G. W.; McLean, K. S.
Department of Entomology and Plant Pathology, Mississippi State University, Mississippi State, Mississippi, USA.
1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1.
Conference Title: 1995 Proceedings Beltwide Cotton Conferences, San Antonio, TX, USA, January 4-7, 1995: Volume 1, p.209-211
Publication Year: 1995
Publisher: National Cotton Council, Memphis, USA
Language: English
Document Type: Conference paper