



Integrated Pest Management for Cotton: An International Project Funded by the Common Fund for Commodities (CFC)

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ABSTRACT

This joint international project involves Egypt, Ethiopia, Israel and Zimbabwe. It aims to develop integrated methods for the control of whitefly and aphids, the insects that cause stickiness. The CFC approved the project in 1994 for a research period of four years and extended it into a fifth year. The project is now in its fourth year and managed by a management committee at the Israel Cotton Production and Marketing Board Ltd., designated by the Fund Project Execution Agency (PEA). Training programmes and workshops are planned for the concluding years of the project, including comprehensive reports and summaries of the findings, along with guideline manuals for end users.

Objectives

The specific objectives include the production of high quality non-sticky cotton, improvement in profitability for both raw cotton producers and processors and the reduction in damage to the environment.

The project is developing new target oriented environmentally compatible pesticide formulations and application methods; promoting biological pest control; developing guidelines for economic use of these methods and disseminating the project findings to staff of participating and other countries.

Activities and project status

Research, testing and development are in progress in Israel and in Egypt. Field tests and development are under way starting from the second project year in Zimbabwe and Ethiopia.

Activities in Israel are the co-ordination of four different and independent research groups of three distinct research organizations. The entities involved are Israel Ministry of Agriculture (IMA) – Agricultural Research Organization (ARO) – Chemistry and Engineering Dept.; Tel Aviv University (TAU) and Sivan/Granot Research Dept. in conjunction with the IMA Extension Service., the Plant Protection Research Institute (PPRI) is leading the project In Egypt, the Commercial Cotton Growers Association (CCGA) in Zimbabwe and the Institute of Agricultural Research (IAR) in Ethiopia.

Monitoring and co-ordination of research activities is followed on a regular basis by project management at the PEA in Israel.

Development of target oriented, environmentally compatible pesticide formulations

Activities at present are divided between research on new or modified formulations and intensifying studies of the most promising. Parameters under study are stability, behavioural and toxicological activity on various life stages, activity duration, phytotoxicity tendencies and foliar residue characteristics. Formulations that passed laboratory trial criteria were cleared for field trials. Two such formulations, designated as “No. 3” and “No. 4” were found to be very effective against whitefly under field conditions. In addition, mineral oils are under assessment for efficacy against whitefly in Egypt.

Design of criteria for a cotton sprayer and design of a new sprayer

The development of an “over the crop drop-tube sprayer” is continuing. Experiments on the one-row prototype of this sprayer in 1997 have shown that it is capable of creating vortex streams from the ground upward, resulting in an even, dense coverage of all the lower plant parts. A six-row sprayer has been designed and constructed and is in preliminary tests in 120 cm high cotton fields. These tests are aimed at determining the final geometry of the drop-tube, air duct and the nozzle location. Most of the experiments involve spraying ultra-violet tracer in the field and counting droplets on leaves and other plant parts in the laboratory.

A manual operated sprayer for “low toxicity” materials is under development and the final design of the components has been completed. Rotary atomizers (Micron-Mini-ULVA) were chosen and tested for droplet size and spray cloud geometry at different positioning. Two different models for relatively large (ULP / 100) and for small (MUL / 100) droplets were chosen. The sprayer design

permits installing either of the models. An air carrier duct is also under construction. The manually operated sprayer was completed and tested during September 1997.

Biological Control Methods

Natural enemies of cotton are often responsible for the prevention of outbreaks and avoidance of damage so it is important to establish the appropriate natural enemies in the field, encourage their activities and protect them from hazardous effects of insecticides. Activities include surveys on the presence, effectiveness and means of conserving and utilizing natural enemies in the cotton agro-ecosystems, evaluation of the toxic effects of new and established insecticides on natural enemies, introduction of additional natural enemies to control pests, to transfer and augmentation of existing beneficial fauna and integrate the use of natural enemies with other methods, according to thresholds.

Affirmation of appropriate economic thresholds for the new methods

The hypothesis used is that the pests in question tend to exhibit exponential growth. The control strategies and the underlying thresholds, therefore, must serve to prevent massive build-up. In order to develop strategy based on cost/benefit analysis, the influence of pest levels during selected crop growth periods on quantity and quality is being investigated. In addition, precise scouting methods are being developed to estimate natural enemy effects on threshold related decisions and comprehensively to optimally utilize natural enemies and other novel pest control approaches. The ultimate goal is to develop action guidelines for growers.

Knowledge dissemination

Project Coordinating Committee (PCC) meetings take place annually, involving project and component leaders and additional staff. Three training programs (2 in Israel and 1 in Egypt) involving staff from all participating countries took place during 1997. In addition, training programs and workshops for participating and other countries are planned for the concluding years of the project, including comprehensive reports and summaries of the findings will be compiled, along with guideline manuals for end users.

Field testing

Extensive field trials are under way in all participating countries. In Israel field trials include novel material screening for phytotoxicity and control efficacy, prototype sprayer efficiency and replicated prototype material trials. Additional trials include biological control in the greenhouse and in the field and the evaluation of thresholds. Field trials include manual backpack sprayer trials, mineral oils

control, novel material and natural enemy experimentation in Egypt. Replicated field trials were conducted at three locations in Zimbabwe on novel materials, biological control and spray methods and there was an independent evaluation of various hand held sprayers. Screening of novel material, biological control and aphid economic threshold level were studied in Ethiopia.

Project activities have reached a focusing stage. Screening procedures are being increasingly replaced by in-depth investigation of fewer prototype materials and technologies and work is now limited to further development of the leading ideas. Biological control work is focusing on novel material application, including application technology.

