

NEW APPROACHES TO INSECT CONTROL

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I have been in the business of cotton insect management for over 30 years and there has never been a period during this three decades where there were more new technologies and approaches available to the cotton farmer for use in insect management. Industry and government scientists have expended millions of dollars toward the development of new technologies designed to increase the profitability of cotton farming through increased efficiency of insect control. Despite these new innovations, farmers generally are finding it more difficult to make a profit producing cotton; many are shifting some of their cotton acreage to other crops, some are abandoning cotton and some are leaving the profession entirely. Lets face the facts, new technologies are costly and cotton prices are not keeping up with increased production costs. Those who will continue to produce cotton profitably will be the ones who adopt only the essential, cost effective technologies for their farming operations. Determining which of the new technologies are essential and which will enhance production is a major problem facing producers and their advisors. A brief overview reveals the extent of the new tools and programs currently available for insect management.

First and foremost among the new technologies are the transgenic *Bt* cottons which are resistant to many caterpillar pests. The *Bt* cottons became available in the "nick of time" to combat insecticide-resistant tobacco budworms. The \$32/acre technology cost for *Bt* cottons has proven to be money well spent in areas where excessive expenditures were directed toward control of tobacco budworm and control remained unacceptable. Also, in areas where pink bollworm is a major pest, *bt* cottons have definitely increased profitability. However, in regions of the cottonbelt where these two pests are less important the decision to invest in *Bt* cotton is more problematical. The spatial variation across the cottonbelt in the percentage of acreage planted to *Bt* cottons is a function of the insect pest complex and production economics for each production area. *Bt* cotton will remain a minor player in many areas of the cottonbelt as long as the technology cost remains higher than the cost of controlling caterpillar pests with conventional insecticides.

Secondly, insecticide resistance in tobacco budworm, cotton aphid and other species has stimulated a renewed effort in the agricultural chemicals industry to develop and market insecticides with novel modes of action. For example, Applaud™ and Knack™ have been very effective as IGR's

against whitefly pests and Tracer™ has provided good control against insecticide-resistant tobacco budworms. Many other new insecticides will soon be registered for use against caterpillar pests and it is anticipated that Regent™(fipronil) will soon be registered for control of boll weevil and plant bugs. There are numerous other new insecticides in various stages of development that target one or more species in the cotton insect pest complex, but there are several problems associated with these new insecticides. First, they all are rather selective in their toxic action; for example, some control certain caterpillar pests and nothing else. Selectivity in insecticides is a desirable trait, but it can be a double-edged sword. Killing one pest and leaving others to flourish most often leads to the necessity for insecticide tank mixes and/or additional applications. There will never be a class of insecticides as broad-spectrum and cost-effective as the pyrethroids were during their heyday. The new insecticides cost much more than those which they are replacing and their selectivity may result in more total insecticide expenditures.

New techniques are rapidly being developed to improve the efficiency of pest control decision-making. Lepton HTK™ is a heliothine diagnostic kit that should allow for accurate species identification in the egg and early larval stages. Other diagnostic kits are being developed which will determine whether insects are resistant to certain insecticidal compounds. These systems should provide greater efficiency in insecticide selection for some insect pests.

Expert systems computer software also has been developed to improve management efficiency. COTMAN, for example, monitors plant development and injury, diagnoses early-season stress, and times insecticide termination according to plant maturity and late-season weather risks. Hopefully, cotton farmers will find that use of these computer based systems reduce production costs and increase profits. However, the limited acceptance and utilization of Gossym-Comax and similar systems create some doubt as to their widespread adoption.

Boll Weevil Eradication doesn't involve the use of new technologies and isn't a new program, but expansion creates a new program for affected areas. Eradication of the boll weevil has proven to be the enabling event most responsible for the resurgence of cotton as a major crop in the Southeast U.S. and should be of great benefit to other areas as well. Also, many of the new caterpillar control technologies such as *Bt* cottons and caterpillar selective insecticides may be most effectively used where the boll weevil has been eliminated as a pest. The program costs in the areas of expansion will pose an immediate financial burden to farmers, but the returns on the investment should begin to be realized in the second year with an overall reduction of insect control inputs. This assumes optimum execution of the action plans.

Biological control is one area where promise for environmentally sound and sustainable insect management systems has not been realized despite substantial funding for research. A wealth of knowledge has been generated on the interactions of endemic biocontrols and pest species. We have learned the importance of conserving biocontrol agents. We must now focus research efforts on identifying factors which are responsible for high pest mortality from the combined action of predators and parasitoids. Also, we must develop an understanding of the environmental criteria which need to be met to create epizootics of insect pathogens. Unfortunately, there are no examples of commercial successes for the mass rearing and the inundative releases of biological control agents in cotton. Over the years we

have heard Trichogramma, Catolaccus, and others ad nauseam. The concept sounds great and gives everyone that "warm and fuzzy feeling", but practical application has failed. One must ask those who have championed biological control programs at previous Beltwide Cotton Conferences, "where's the beef"?

Obviously there are other technologies which I could mention, but time doesn't allow for complete, nor detailed coverage of the topic. Let us now turn to our producers to find out what they think of the new technologies and programs and how these new developments are affecting the economics of their farming operations.