THE *LYGUS* PROBLEM

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ABSTRACT

This paper introduces a series of papers that were originally presented at the *Lygus* Management Symposium, held at the 73rd Annual Meeting of the Southeastern Branch of the Entomological Society of America, which was held at Destin, Florida, February 28 - March 3, 1999. Designed to set the stage for the more detailed papers to follow, this paper includes some introductory information on *Lygus* spp. biology and ecology. However, we know that some species of *Lygus* regularly cause severe losses in many important crops. Thus, the *Lygus* problem takes the form of the question: how do we effectively manage these pests? Much of this paper, therefore, focuses on pest management philosophy and approaches to build a framework for development of a cost effective system(s) for *Lygus* spp. management. Finally, the organization and goals of the symposium are discussed.

INTRODUCTION

The genus *Lygus* of the family Miridae is widely distributed and contains several species that are pests, at least occasionally. In the U.S., these pest species include: the western tarnished plant bug (*Lygus hesperus* Knight) (WTPB), the tarnished plant bug (*Lygus lineolaris* (Palisot de Beauvois)) (TBP), the pale legume bug (*Lygus elisus* Van Duzee), and *Lygus desertinus* Knight (no common name) (Leigh et al. 1996). TPB is most important in the Eastern U. S., while WTPB is most important in the west. These insects feed on the leaves, stems, and, most importantly, the fruiting bodies of a wide variety of plant species (almost 400 in the case of TPB), including numerous agronomically important plant species (Layton, this volume). *Lygus* spp. have a short generation time, as short as 20 days in warm weather, and are multivoltine. They are relatively cryptic, have high reproductive rates, are active from early spring to late fall, and are highly mobile (Leigh et al. 1996, Raulston et al. 1996, Stefferaud 1952, Wagner et al. 1996). These characteristics make for potentially serious pests.

Crops such as cotton can tolerate low densities of *Lygus* spp. with no loss of yield or quality (Falcon et al. 1971, Gutierrez et al. 1975). However, populations that cause severe damage do occur. With crops such as strawberry, on the other hand, even relatively low levels of infestation can cause significant losses (Welter, this volume). In the Southeastern U.S., TPB can be an important pest in cotton. However, this pest has generally been managed coincidentally through insecticidal treatments for boll weevil (*Anthonomus grandis grandis* Boheman) and heliothines. In the West, use of pesticides for WTPB control in cotton have been

shown to cause severe outbreaks of some secondary pests (Ehler et al. 1973, Eveleens et al. 1973, Falcon et al. 1968, Gutierrez et al. 1975, Walker and Smith 1996).

Management practices in the Southeast are changing. The boll weevil eradication program is successfully pushing this key pest out of the picture and transgenic cotton is reducing concern regarding heliothines. Also, *Lygus* spp. are developing resistance to some important pesticides (Miller 1996, Snodgrass 1994, 1996) and the Food Quality Protection Act may force some useful insecticides off the market. Thus, in the Southeast particularly, there is increasing concern about the potential for *Lygus* spp., particularly TPB, to cause severe losses. If we have to apply conventional pesticides for *Lygus*, we will not reap the benefits of the boll weevil eradication program and the introduction of transgenic cotton varieties. Thus, the *Lygus* problem takes the form of the question: how can we most efficiently manage these pests?

PEST MANAGEMENT PHILOSOPHY

Pest management practices have evolved over the years. Prior to the introduction of conventional insecticides, we practiced a lot of cultural and biological control. We also shared a considerable portion of our yield with pest insects. Yet, particularly in the 50 years prior to the introduction of DDT, we made significant progress in developing pest management methods that were based on ecological principles (Rabb 1970). With the introduction of modern insecticides, we thought that we had the "silver bullet," threw ecological principles to the wind, and sprayed everything. We used prophylactic sprays to prevent the occurrence of pest problems. Then, with the publication of *Silent Spring* (Carson 1962), we had a rude awakening to the fact that these powerful and valuable chemical pest management tools also had some associated problems. Then the concept of integrated pest control emerged, or as it is now more commonly known, integrated pest management (IPM)(Nordlund 1996). Conceptually, IPM was to make use of all available pest management tools in a logical system designed to reduce pest populations with the least amount of environmental disruption (Nordlund 1996). In practice it became a pesticide management scheme in which conventional pesticides were used based on the existence of a problem - documented through scouting. Thus, we moved from the use of pesticides to prevent pest outbreaks to the use of pesticides to treat (correct) pest outbreaks. Now, it appears that we are beginning to make a stronger effort to use non pesticide approaches to pest management (Fig. 1) in our IPM programs. We still have a long way to go, however, to significantly reduce our reliance on conventional pesticides. I do not know what the future holds, but I hope that the question of scale will become much more important in pest management.

Various authors have made attempts to categorize our pest management strategies. Rabb (1972) listed four categories: eradication, population management in large areas, management of localized populations, and temporary alleviation. Knipling (1979) listed corrective and preventive pest control measures. Corrective measures were defined as application of control measures only where and when the insect is causing damage. Preventive measures were defined as: application of control measures now to suppress pests in anticipation of damage even though there is no certainty that damage will occur in a localized area. We know, intuitively, that prevention of a problem is generally less costly than having to take corrective action after the problem has occurred. However, we often do not have an effective strategy for preventing pest outbreaks and are forced to resort to use of conventional pesticides to correct the problem. Fig. 2 provides a teeter-totter metaphor for pest population growth. We realize, from our childhood experiences with teeter-totters, that placing just a little "weight" on the right end of this teeter-totter will cause a major decline in the pest population while removing a little "weight" from the

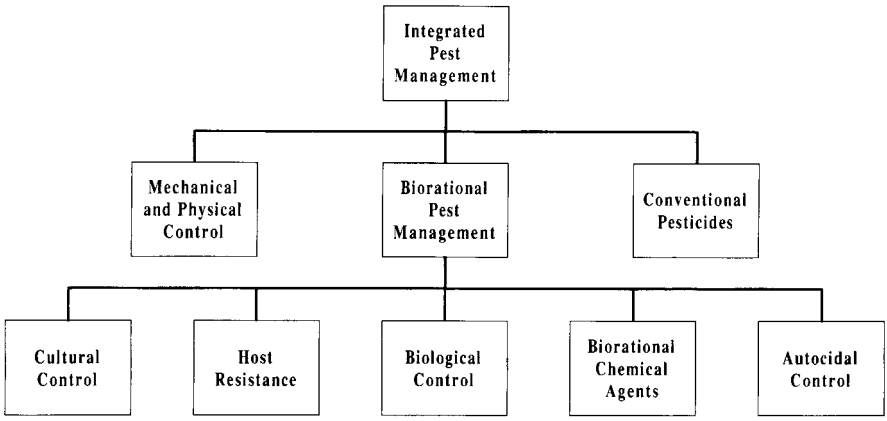

FIG. 1. Pest management and control techniques that are included within the conceptual model for integrated pest management (after Nordlund 1996).

right end will result in a major population increase. The important thing to realize when applying this metaphor, however, is that, with highly mobile pests, the control action ("weight") must be applied to the whole population, not to an insignificantly small part of that population.

Historically, in the U.S., pest management has been, primarily, the responsibility of the individual farmer. This generally left each farmer at the mercy of those around him or her, often forcing a defensive mode of action, which resulted in an almost total reliance on conventional pesticides. There are, of course, many arthropod species that can cause damage and which are occasional pests. A field-to-field/farm-to-farm approach of managing these species may be the most effective approach. However, there are a few arthropod species that without some aggressive control measures are serious pests almost every year. A field-to-field/farm-to-farm approach is probably not adequate for these species. An area-wide approach for total population suppression (Knipling 1979) may be the most effective and efficient approach to dealing with such pests. *Lygus* spp., particularly TPB and WTPB, though worse some years than others, consistently cause significant damage over wide areas and they are highly mobile. Thus, they appear to be good candidates for such an approach. Area-wide management moves the decision-making authority for management of these pests, from the individual farmer to a group authority. This authority could be a cooperative organization, but is often a governmental or quasi-governmental organization. Area-wide management is a global (in terms of the defined system), coordinated and offensive strategy designed to reduce the pest population to easily managed numbers. It generally provides a lasting, relative to the farm to farm approach, solution to the problem. However, developing the technology, infrastructure, and support for such a management system is difficult. Much of this symposium will focus on an area-wide approach and some tools that could be used in such an approach to TPB management in the Southeastern U.S.

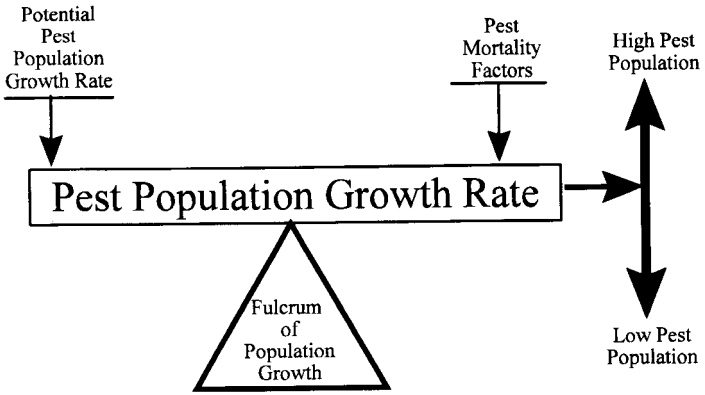

FIG. 2. A teeter-totter metaphor for pest population growth. The potential pest population growth rate on the left represents that of the entire pest population. Thus, the pest mortality factors on the right represent those for the entire pest population. With this concept in mind, a slight increase in pest mortality when applied to the entire population can result in very low pest population densities.

ORGANIZATION AND GOALS

The papers in this volume were originally presented at the *Lygus* Management symposium held at the 73rd Annual Meeting of the Southeastern Branch of the Entomological Society of America, which was held at Destin, Florida, February 28 - March 3, 1999. The symposium was organized to initially provide some review of basic *Lygus* spp. biology and ecology followed by discussion of management in high value crop systems and sampling methods. Discussions of how various management practices can contribute to the success of an area-wide program, particularly for TPB in the Southeastern U.S. followed. Finally, there was discussion related to advancements that may make the use of augmentative biological control of *Lygus* spp. a viable component of an area-wide program.

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