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## **IPM – AN OVERVIEW**

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ABSTRACT: Integrated Pest Management (IPM) is a term that is widely used, but little understood. The Federal Interagency IPM Coordinating Committee adopted the description of IPM as "a systems approach to reduce pest damage to tolerable levels through a variety of techniques, including predators and parasites, genetically resistant hosts, natural environmental modifications and, when necessary and appropriate, chemical pesticides." Essentially, the ultimate goal of IPM programs is to reduce pest populations to "tolerable levels". This may be a departure from more traditional approaches to pest control that advocated the elimination or eradication of pest populations. Another postulate of IPM is that any control measure undertaken against a pest population be economically justified. The "economic injury level (EIL)" needs to be identified for each pest within a total management system. There is the continuing need for both basic and applied research by interdisciplinary teams to fully implement and benefit from IPM programs.

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Integrated Pest Management (IPM) is a term that has been widely used but little understood. IPM has become the 'buzz' or 'in' phrase in Washington circles as the solution to all pest problems and many environmental issues. When IPM is implemented fully in approaching solutions to pest problems it does offer efficient pest control and environmental preservation, but IPM programs have not as yet reached their full potential. In fact, more often than not when someone says, "I have been involved in IPM for years, but didn't call it by that name", I become concerned because many of the principle concepts have usually not been explained or implemented.

More often than not when someone refers to IPM, what is meant is effective insect pest control. The entomologists are usually given credit for the development of the rudiments of IPM through the "cotton field scouting" implemented in the cotton belt of the United States in the 1930's. The field scouting aspects of IPM have been greatly enlarged upon and effectively promoted by the United States Department of Agriculture and several other federal agencies including the Environmental Protection Agency (EPA) and the Council on Environmental Quality (CEQ). It has been the Extension Service of USDA that has been the major in-field promoter of the concepts of IPM. The evolution of extension IPM programs in the United States has been well documented by Blair and Edwards (1979). Briefly, the first of the IPM pilot projects was initiated in 1971 and was directed against tobacco insect pests in two states. The scope of programs was expanded so that by 1978 federal funds were available to all states and protectorates. At least one IPM program had been implemented in consonance with stated USDA goals for the IPM programs.

Added emphasis was given to the concepts of IPM when President Carter in his Environmental Message of August 2, 1979 stressed the adoption and support of these programs. He said, "I recognize that integrated pest management has both economic and environmental benefits and should be encouraged in both research and operational programs of federal agencies. Therefore, I am directing that each of your agencies: 1. Modify as soon as possible your existing pest management, research, control, education, and assistance programs to support and adopt IPM strategies wherever practicable within the limits of

existing resources; 2. Review your pest management research, control, education, and assistance programs to assess the potential for increased emphasis on integrated pest management; 3. Report actions taken to implement IPM strategies and the results of this review and assessment to the IPM coordinating committee in six months." In the same address, the President established an interagency IPM Coordinating Committee to assure implementation of this directive and to oversee further development and implementation of IPM practices. The committee was chaired by the Council on Environmental Quality (CEQ). The "Report to the President - Progress Made by Federal Agencies in the Advancement of Integrated Pest Management", was submitted on June 30, 1980. In that report, the Interagency IPM Coordinating Committee adopted the description of IPM as "a systems approach to reduce pest damage to tolerable levels through a variety of techniques, including predators and parasites, genetically resistant hosts, natural environmental modifications and, when necessary and appropriate, chemical pesticides".

There have of course been several working definitions of IPM, in fact the development of definitions was part of national and regional workshops held at Purdue University in 1972, Kansas City, Missouri in 1977, and St. Louis, Missouri in 1979. All of the various definitions, however, are akin to that adopted by the Interagency IPM Coordinating Committee as stated above.

Following the President's message concerning IPM, support increased nationally both through recognition and funding for pilot and continuing projects. Late in 1979, and following the President's speech, Extension Administration (in a letter to State IPM Coordinators) stated, "for the purpose of planning, the objectives of the Extension IPM program are to (1) develop and implement an effective, integrated program to prevent or mitigate losses caused by pests through use of biological, cultural, chemical, and varietal methods of control; (2) implement practical methods for monitoring pest populations in farmers' fields; and (3) provide farmers and others in the private sector with information and training in the principles of IPM. The legislative intent of Congress is that there be a commitment to reduce pesticide uses."

The inclusion of the statement "reduce pesticide uses" elicited the expected responses from the pesticide industry which in 1972 had in effect adopted an official policy on IPM supporting "programs which have as their ultimate objective the achievement of pest suppression based on sound ecological principles which integrate chemical, biological, and cultural methods into a practical program, where necessary and possible" (Sine 1978). On this point the agricultural chemicals industry has expressed concern and dismay at the approaches that have been taken by governmental agencies concerning the use of pesticides.

Essentially, the ultimate goal of IPM programs is to reduce pest populations to tolerable levels. The concept of "tolerable levels" may seem in opposition to the more traditional approach of pest elimination or eradication. The idea is that some level of pest population can be endured if the damage caused is below an economic or aesthetic injury level. The "economic injury level (EIL)" is that point at which pest populations begin to cause economic losses (Smith 1981), or is the lowest number or density of a pest population that will cause economic losses in yield or quality equal to or greater than the costs of control or prevention (Mock et al. 1981). In order to evaluate the economic loss potential of a pest population, it is therefore necessary

to monitor that population through time in an attempt to both learn of the biological parameters that influence population growth as well as learning the best point to implement artificial controls including habitat management and/or chemicals.

The second goal in an IPM program is to maintain pest populations at levels that are below the EIL and to insure that that threshold is never exceeded. Watson et al. (1975) indicate that the four elements of IPM to accomplish this are: 1. utilization of naturally occurring suppression measures including habitat modifications that provide for ecosystems that are less favorable for pest growth and development; 2. using sound economic levels as the basis for applying artificial control measures including pesticides; 3. sampling of all elements of the habitat harboring the pest species in order to measure the pest population level against the economic level; and 4. understand the biology and ecology of the pest species in order to direct the control procedures at the vulnerable stage.

Once understood, the principles of IPM make sense and would appear to be a reasonable approach to pest control. So why aren't all sectors of the agricultural community involved in IPM programs? I am sure there are several reasons for this, but a few that have been mentioned by colleagues are that a particular pest (weeds or vertebrate pests) have a zero economic threshold and therefore the tolerance levels for populations of pests are impractical; or there is so much basic science involved in IPM that the producing community doesn't want to be inconvenienced with the monitoring; or perhaps IPM has been over sold in what it can realistically accomplish. In addition, others have expressed concern that IPM will be used by regulatory agencies such as the EPA to limit the use of selected pesticides to IPM programs. I feel that all of these responses can be answered and that IPM can be implemented against most pest situations. In saying this I do realize that there are specific situations or pest populations that do have a zero economic or aesthetic threshold, but even in these situations control can be achieved in an effective manner using these principles.

The last concern that I will discuss is that expressed by Knake (1978) who observes that the term integrated is simply used to refer to combining various controls within one discipline (entomology), when in reality it is more than that. Integrated really refers to interdisciplinary approaches to pest management. There appears to be greater acceptance of this idea now as indicated in IPM programs being conducted on the state and regional levels (Gold 1979). It is these holistic and interdisciplinary approaches that analyze and assess total pest problems within a complex of hosts and/or sites that will determine the future contributions that IPM will make.

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