AN ENTOMOLOGIST'S PERSPECTIVE ON POTENTIAL INSECT PROBLEMS

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There are two different ways to approach the question of potential insect problems. The first is probably the most obvious: introduction of new insect pests into the areas where plants are either produced or used. The second is less obvious, but potentially more complicated to approach. That is, the shift in public attitudes and the regulatory environment may limit the tools available for insect pest management, and consequently, insects that are now of minor importance because they can easily be controlled may become serious management concerns in the future. Solutions to these potential problems will require creativity, consumer education, and flexibility on the part of the industry.

INTRODUCTION OF EXOTIC INSECTS AND PLANTS

California is blessed with a diverse climate that is hospitable to a broad range of plant species. The horticulture industry has introduced a tremendous variety of ornamental plants that have become integral parts of the landscape. The urban forest that we now enjoy in southern California is primarily ornamental and comprised of a mix of native plants, plants introduced from other parts of the state, plants from other parts of the continent, and plants from all over the rest of the world. Fortunately, many of the introductions have been carefully made so as to avoid also introducing insect pests or diseases.

However, despite the obvious care made at the time of introduction, there has been reestablishment of pests with the plant. In many of the cases in which we are now familiar, the pests were introduced without the associated natural enemies. For example, eugenia psyllid, pepper tree psyllid, ash whitefly, and eucalyptus longhorned borer are rarely or only occasionally reported as pests unless the biological control agents in the endemic systems are disrupted. These biological control agents, both predacious and parasitic insects, are important factors in reducing the pest numbers in the native range of the pest.

Not every introduction results in the establishment of new pests, but those that are adapted to the new environments or to new plant hosts in those environments can build up to damaging levels. Sweetpotato whitefly has been introduced into California and

has moved onto several new host plants that are economically important. Similarly, native insect species can shift onto newly introduced host plants and cause damage. There are occasions where insect populations build up on non-economic hosts or in non-economically important environments because of specific or unusual environmental conditions (e.g. drought) and then move into other areas or onto other hosts and cause injury. These outbreaks are difficult to predict and will continue to occur.

However, although the damage caused by outbreak pests can be severe, the injury caused by chronic pest complexes is more critical to control. Production of any horticultural plant requires managing a suite of pests on a regular basis. The plant qualities associated with efficient production (e.g. uniformity of shape and form, narrow range in development or maturation time, patentability) may work against reducing pest populations. That is, the plants are selected for their commercial success and for the ease of production with a minimum amount of genetic variability. The narrow genetic base could result in a limited amount of variation in resistance to insect pests; furthermore, variation in the insect pest population combined with the tremendous reproductive potential of many pests can effectively overcome the plant resistance within a very short period of time.

Obviously, one of the best ways to limit the injury caused by the introduction of new insect pests is through sanitation. Movement of infested plant material expands the geographic range of pests or reestablishes infestations in otherwise clean growing areas. The state and federal inspections at borders and international points of entry are designed to reduce the movement of infested products into the country. Insects are capable of dispersing over large areas once established and that is why there is such a major emphasis at preventing establishment.

PUBLIC PERCEPTION AND REGULATORY PESTS

The problems associated with pest management are no longer confined to the boundaries of the commercial enterprise. Regulation of pest management stems from a growing environmental awareness on the part of the general public. Consequently, the regulatory environment will have a major impact on potential insect problems. Specifically, chemical control options and materials are being removed from the market, either voluntarily by the manufacturer, by direct governmental regulation or, in California as a specific case, are never offered for sale. Without the tools that have been relied upon in the past, insect pests that have been relatively easy to control may present new problems, and key pests may become very difficult to manage.

In addition to the problems associated with regulation, the public attitude appears to be growing increasingly intolerant of pesticide residues. The primary focus has been on food safety and pesticides applied to food crops. Some retail food stores have contracted with pesticide testing services to check produce and certify it as pesticide-free in order to improve their market image and sales. Similar public attitudes toward pesticide residues are becoming apparent in the structural pest control industry, with new and novel non-chemical control strategies for termite control finding an increasing share of the market. It is highly likely that the ornamentals industry will also feel pressure to supply pesticide-free products for the market. Depending on how strongly and how quickly this trend develops, the industry may find itself with new insect problems as it tries to develop compatible control alternatives.

POTENTIAL SOLUTIONS AND MANAGEMENT ALTERNATIVES

While insect and disease resistance of ornamental plants has been used only minimally to date, it has been an important pest management tool in other horticultural production. The use in ornamentals has focused on tree resistance to insects and diseases (e.g. elms for resistance to Dutch elm disease and ficus resistant to Cuban laurel thrips). The role of host plant resistance needs to be increased for two primary reasons. One, the resistance will improve the ability of producers to grow clean plants. Secondly, and possibly more importantly, resistance will help maintain the market for the plant material. In situations where plants have been put into the landscape and have continually been plagued with problems, the demand for that species has declined. The current problems with eugenia and eugenia psyllid, or ornamental pears and ash whitefly are good examples. Admittedly, there are problems with expanding the genetic variation among individuals and increasing the importance of resistance over characters associated with plant form, synchrony, or production ease, but these may be technical obstacles that can be overcome.

Biological control will also become increasingly important. It may be very possible to rely on the use of natural enemies for control of insect pests during part of the growing cycle of the plant. That is, there may be times during production when the plants can tolerate a minor amount of injury, enough of a pest population to support a population of natural enemies and to prevent the pest population from building up above the threshold levels. However, this requires development of realistic threshold levels of injury that can be tolerated. At other times, particularly as the plants are nearly marketable size, other pest management approaches may be appropriate.

In addition to the use of biological control within the fence lines, the industry must expand its horizons to rely on biological control to reduce movement of pests into production areas. Most producers maintain low pest populations within the growing areas because there is strong incentive to do so. In the landscape, usually much higher pest densities are tolerated. The outside areas become sources for infesting populations. Specifically, for the insects that have been introduced into California without their complement of natural enemies, this influx of insects from the landscape has been the primary source of production problems. Introduction of natural enemies into the landscape through the support of classical biological control programs is a principal way of reducing the influx into the production sites. That is, the natural enemies contribute to the control of the pest insect populations, but not just those in the nurseries. The nursery industry within the state has been very foresightful in supporting these types of biological control programs, knowing that general releases of natural enemies will, in a short time, have a direct benefit to their production.

If several of the broad spectrum insecticides are removed from the market, other materials may become available for use. Several companies are developing a new generation of insect growth regulators that kill insects by disrupting the physiological processes of development. These chemistries often have less mammalian toxicities and are safer to use. In addition, there is increasing interest in properly applied feeding deterrents, desiccants, soaps, and oils. Some biological materials not traditionally classed as pesticides but are applied in the same manner include the bacteria, viruses, nematodes, and fungi that can be integrated into a pest management program. Commercial development of these products was stalled following the introduction of relatively cheap and highly effective synthetic pyrethroid insecticides but has increased dramatically in recent years because of public demand for non-chemical control alternatives.

Innovative techniques for cultural management of insect populations are also being developed. Row covers of spun polyester are used to protect young plants from aphids and whiteflies. New screen technology is currently marketed for weed control and to prevent entry of insect pests into glasshouses. Barriers or bands of sticky material can be applied to trap moving insects. For example, plastic sheeting coated with a sticky material has been marketed to be placed below a growing crop to catch and kill thrips pupae. Pheromones are being tested to either mass trap, confuse and prevent mating, or inhibit insects from arriving on susceptible hosts. These chemicals are released in tiny quantities and are usually specific for one insect species.

There are many combinations of alternative management approaches available to develop an integrated pest management system tailored for production of a specific crop. The ornamentals industry has an opportunity to capitalize on a new and environmentally aware market. Their primary product is plants that enhance the environment of the consumer and can be sold as products grown in an environmentally sound, or "green", manner. However, this will require education and creativity on the part of the industry to develop acceptable products. It will also require education of the consuming public so that they will appreciate the efforts of the industry and increase the demand for "green" products to improve everyone's environment.