

SYMPTOMATOLOGY IN THE INSTRUCTION OF LANDSCAPE ORNAMENTALS ENTOMOLOGY

by Carlton S. Koehler

Abstract. In the teaching of landscape ornamentals entomology in off-campus Cooperative Extension shortcourses, the student often is more interested in pest problem diagnosis, than in instruction organized by insect grouping or host plant. Diagnosis is based on symptoms and signs; those caused by arthropod or mollusk pest attack can be conveniently organized into five categories: 1) chewed foliage or flowers, 2) stippled, bleached, bronzed, streaked or silvered foliage, 3) distorted plant parts, 4) dieback of plant parts, and 5) products on plant parts produced by insects, mites, or snails and slugs.

Teachers of entomology traditionally have organized classroom instruction about insects of landscape ornamentals, and the damage they cause, in one of two ways. (1) *By insect family or order.* The important pests that are beetles, moths, aphids, etc. are covered and their hosts, biology, and other characteristics are enumerated. This is the classical or traditional approach. (2) *By host.* The significant pests of each of the important ornamental plants in the region are enumerated and the pest's appearance, biology, and damage are described. This approach is typically used after the student has taken a prerequisite course in insect identification.

These two approaches usually are appropriate to formal classroom conditions when an entire academic term, semester, or year is available and the course is part of a plant protection program. When time or academic background of students is limited, however, as is often the case when teaching ornamentals entomology to landscape maintenance personnel, nurserymen, pesticide applicators and other groups that are Cooperative Extension's traditional clientele, the student may be left confused, if not discouraged, by the large number and diversity of arthropods that affect ornamentals, and by the artificiality of the above two approaches in relation to the student's practical workplace needs. In this subject area the principal interest of Extension's students is identification and diagnosis of problems caused by insects and

their relatives, and their management—not in some of the more esoteric aspects of entomology which are standard fare in the formal classroom environment.

Experiences both in formal classroom and in off-campus Extension teaching in ornamentals entomology have resulted in my moving away from the family/order and host approaches, in favor of one based on symptomatology, when instructing Extension clientele. Although these experiences relate primarily to West Coast ornamentals and their pests, the proposed diagnostic scheme should be directly applicable to other regions of the country.

Nature of Damage by Ornamentals Pests

The major pests considered in the following discussion are arthropods (insects and mites) and mollusks (snails and slugs). Relatively few of these pest species kill the plant on which they feed. Most merely disfigure plants in a variety of characteristic ways. All pests must feed in order to survive and reproduce, and in so doing, cause visible and predictable changes in the plant's appearance. This enables the trained observer to narrow the range of possibilities as to the identity of the offending pest. It is this change in the usual, or normal, appearance of the plant that usually first attracts attention, not the presence of pests, for these are often small, camouflaged, or otherwise not readily visible. A symptom is the expression of what the insect has done, or of a plant's response to an attacking organism; a sign is the pest itself, or a product of it. For the purposes of this paper, however, it is not important to distinguish symptoms and signs.

Symptomatology

Symptoms associated with insects and other pests on landscape woody ornamentals can be

conveniently grouped into five categories:

Category I: chewed foliage or flowers. When this symptom is in evidence, the student can be quite certain that it has been caused by a pest with chewing mouthparts. One can immediately dismiss from consideration a large group of pests with mouthparts equipped to suck or rasp, for except in unusual situations the feeding of such arthropods does not result in tattered plant parts. The most important of the pests causing Category I symptoms are larvae of moths and butterflies, larvae and often adults of beetles, sawfly larvae, grasshoppers, and snails and slugs.

Category II: stippled, bleached, bronzed, streaked, or silvered foliage. With these symptoms, no loss in the surface area of the foliage surface is seen, for the injury is generally done by insects or their relatives with some form of sucking mouthpart. This symptom often begins with stippling, or flecking, of leaves, resulting from insertion of sucking mouthparts into the leaf and the withdrawal or destruction of chlorophyll at the point of penetration. Tiny to small (pin-point size to 1/8 inch) discolored areas appear on affected foliage. With large numbers of attacking individuals, these stippled areas coalesce, giving rise to leaves which appear partly to mostly bleached, bronzed, streaked, or silvered. On many hosts this injury starts along the midrib and works out toward the leaf margin.

Actually, not all arthropods that cause Category II symptoms possess true sucking mouthparts. Some have rasping or puncturing mouthparts and the pest imbibes fluids which leak from the ruptured plant cells. It is convenient, however, to include rasping or puncturing mouthparts with the true piercing-sucking type.

Insects that mine leaves can also cause discoloration of foliage. These chewing insects feed between the upper and lower leaf surface without affecting the outward shape of the leaf. The consumption of living tissue within the leaf results in light-colored zones which later turn brown. Leaf mines may be long and winding or blotch-like, or a combination of these mine forms.

Those arthropods typically responsible for causing Category II symptoms include lace bugs, plant bugs, spider mites, leafhoppers, and certain aphids, psyllids, and thrips. Leafminers include lar-

vae of certain flies, moths, and beetles.

Category III: distorted plant parts. Plant distortion may be curled or cupped leaves, twisted growing points, or galls of various types on leaves, flowers, twigs, or stems. In many cases the arthropod may not be readily visible on the surface of the affected plant part. Pests typically responsible for plant distortion include aphids, thrips, cynipid (gall) wasps, gall flies, psyllids, and eriophyid (gall) mites.

Category IV: dieback of plant parts. This symptom is characterized by dying of leaves, twigs or branches, and in a few cases by death of the entire plant. Wilting often precedes dieback, and holes and frass issued from them may be seen in woody plant parts. Twigs and branches of deciduous plants that die during the growing season often retain dead leaves well into the subsequent dormant season. In some cases portions of plants such as small branches may be removed by pests such as twig pruners (beetle larvae). Also, certain root-feeding beetle larvae may disrupt vascular transport in such a way that aerial parts of the plant are affected. Boring insects, scale insects, and some cynipid wasps, root-feeding beetle grubs, and adelgids, are suspect when Category IV symptoms are in evidence.

Category V: presence of insect, or insect-related, products on plants. Some arthropods produce evidence of their presence beyond that of plant injury. This symptom group is characterized by the presence of various insect products. Many of these remain intact for weeks—and often months—after the pest has completed its activities. The most commonly seen products, and pests responsible for them, are:

Honeydew (and subsequent sooty mold): aphids, soft (and certain other) scales, leafhoppers, mealybugs, psyllids, whiteflies

Dark fecal specks: lace bugs, greenhouse thrips, certain plant bugs and sawfly adults

Fecal pellets: larvae of moths, beetles, or sawflies

Tents, webs, silken mats: tent caterpillars, webworms, leafrollers, leaf tiers

Spittle: spittlebugs

Cast skins: aphids, leafhoppers, lace bugs, clearwing moth larvae, cicadas

Pitch masses and sap flow: larvae of certain moths and beetles

Pitch tubes: bark beetles

Flocculence (cottony waxy material): adelgids, mealybugs, certain scales, aphids, flatids, and psyllids

Slime: slugs and snails

Discussion

These five symptom categories do not involve five completely separate groups of insects or their relatives, for a single kind of pest may cause more than one type of symptom. Aphids, for example, cause symptoms of yellowing (Category II) and plant distortion (Category III), and are responsible for products such as honeydew and subsequent sooty mold, cast skins, and flocculence (Category V). Some species of aphids commonly cause several kinds of symptoms concurrently. Scale insects may cause dieback of plant parts (Category IV) and leave products on plants (Category V). Snails and slugs cause tattered foliage (Category I) and leave slime trails (Category V).

The student of ornamentals entomology, in learning the problem diagnosis process, must be informed early on that various agents or factors,

such as plant diseases, herbicides, physical injury, or cultural problems, may cause symptoms similar to those caused by insects and their relatives. But whatever the cause of poor plant performance, the plant itself should be allowed to serve as the indicator of what may be wrong. Then, the search for pests or other agents capable of causing the kinds of symptoms seen is a profitable next step. Of course, pests found must occur in numbers sufficient to cause the damage noted, if the diagnosis is to be an accurate one. Finally, the student must keep in mind that more than one kind of pest may be damaging the plant, resulting in multiple symptoms, or multiple causal agents may collectively be contributing to the same symptom.

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Abstract

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Harold Tukey is in charge of one of the most significant new institutions in the U.S. horticultural world, Seattle's recently created Center for Urban Horticulture. Ironically, the handsome structure into which he and his staff moved in the fall of 1984 is situated on a former city dump. But the made-over site is perfect of the Center, with ample room for expansion and a view of one of the broad waterways that make Seattle a delightful place to live and work. An independent department within the University of Washington, The Center constitutes, according to Tukey, "the first horticultural program in America—and probably the world—that's totally dedicated to research and teaching about urban plants and their effect on humans. What is perhaps most surprising and impressive about the institution is that it came about largely through the efforts of a group of influential citizens, all devoted Seattle-area gardeners. And it continues to draw much of its funding and other support from private sources.