

Integrated Pest Management in the Home Landscape

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Insecticides are important gardening tools, but gardeners vary considerably in their attitudes towards pesticide use. Some gardeners are quick to resort to insecticides, while organic gardeners avoid all synthetic insecticides. Most gardeners have some concerns about insecticides and prefer to avoid using them if possible. Individual reasons for this general negative attitude toward insecticides also vary. Some of the most common are:

- concern about acute human toxicity
- concern about potential long-term human health effects
- concern about potential adverse effects to pets
- concern about adverse effects to wildlife
- concern about adverse effects on beneficial insects
- concern about potential phytotoxicity (spray injury to the plants)
- "I don't like the smell."
- "Spraying is just too much work!"

These are all valid concerns. Insecticides are poisons, both by definition and function, and they should not be used casually. Fortunately, the insecticides available to homeowners today are safer and more effective than ever before. Like fire and automobiles, insecticides are useful tools that can be used safely when used properly, but they can cause harm if used improperly. Pesticide labels provide clear instructions on safe use. Always read the label at least twice: once before you buy it, and again just before you use it.

"These bugs are ruining my beautiful plants!" At one time or another most gardeners experience this situation. Severe pest problems can cause even devoted opponents of pesticide use to reconsider their position. After all, if chinch bugs are about to kill the front lawn, or lace bugs are wrecking the azaleas in the side bed, something has to be done to stop them. Sometimes insecticides are the only way to keep pests from damaging prized plants.

But insecticides are not the only tools we have for managing insects. There are many things gardeners can do to reduce the potential for having damaging insect problems that do not involve insecticides. These usually cost little or nothing, and take much less time and effort than spraying. In most cases insecticides should be used as the 'treatment of last resort' to control an insect population that has gotten out of hand. Wise gardeners use non-insecticidal insect management tools to help reduce their reliance on insecticides, but they also know how to use insecticides properly when necessary. This is known as integrated pest management.

Plant Selection and Cultural Practices

What you grow and how you grow it can have a huge influence on potential insect problems. Here are some things that you can do to reduce your chances of having insect problems.

1 } Grow *plant species that tend not to have insect problems*. You can greatly reduce your potential for having insect problems by choosing species that are relatively pest free. Some plants have a lot of insect pests, or one or two serious pests, and you have to be willing to control them if you are going to grow these bug-prone plants. Large-flowered hibiscus are almost certain to be attacked by

hibiscus sawfly, azaleas will sometimes be damaged by azalea lace bug, but loropetalum has few insect pests. Fruit trees provide an even better example. If you don't want to have to spray at all, stick with pears. If you don't mind applying a few sprays each season, plant apples. If you enjoy spraying, grow peaches.

2} *Plant resistant varieties.* Within a given species of plant, some varieties are more pest prone than others. Knock Out roses are less susceptible to most insect pests than are most of the tea roses. Some varieties of Encore azaleas are resistant to lace bugs. It is often difficult to find specific lists showing which varieties are most susceptible or resistant to various pests, but this often gets resolved in the market place. Popular varieties are usually popular because they perform well under a variety of conditions, including insect pressure.

3} *Buy pest-free plants.* Avoid paying for pest problems! Inspect plants at the nursery before you buy them and buy only pest-free plants. Bring home a plant that's loaded with scale and they could spread to other plants in your landscape.

4} *Plant the plant in a suitable site.* Plants growing in sites to which they are not adapted are stressed plants, and stressed plants are more susceptible to insect problems. Azaleas growing in full sun are more likely to suffer injury from azalea lace bugs than azaleas growing in filtered shade. See Extension Publication 666, Selecting Landscape Plants and Information Sheet 965, Transplanting Trees and Shrubs in the Landscape, for more information.

5} *Grow healthy vigorous plants.* Mulch, prune, water, and maintain plants properly. Healthy plants are better able to defend themselves against insect attack and better able to tolerate low levels of insect damage. For example, drought stressed pines are much more susceptible to attack by pine beetles. See Extension Information Sheet 204, Pruning Landscape Plants, for more information on pruning.

6} *Fertilize plants properly.* Excessive nitrogen can make plants more susceptible to insect pests, especially aphids and spider mites. Potassium deficiency predisposes many plants to spider mite injury. See Extension Information Sheet 411, Fertilizing Ornamental Trees and Shrubs, for more information on plant fertilization.

7} *Use non-insecticidal cultural practices that help control specific insect pests.* Cutting and disposing canna foliage during the winter helps prevent canna leaf rollers from overwintering. Misting plant foliage with water can help control spider mites. Building populations of aphids can often be washed from plants with a forceful water spray. See the table at the end of this publication for more examples of cultural practices that help manage certain insect pests.

Know the Pests

1} *Learn which insects to expect on which plants.* Certain plants are prone to certain insect pests. St. Augustine lawns are more likely to be damaged by chinch bugs, centipede lawns are more likely to get spittlebug infestations, and bermudagrass lawns are more likely to have armyworms. By knowing which insects are most likely to occur on the particular plants in your landscape you can be better prepared to deal with pest problems when they do develop.

2} *Know the biology of the pests you are trying to prevent or control and when they are likely to occur.* Do they have chewing or sucking mouth parts? Which life stage(s) causes damage? How many generations are there each year? What environmental conditions favor outbreaks? When do heavy infestations most often occur? Hot dry conditions favor chinch bug outbreaks. Spittlebugs are more likely to be a problem following wet, rainy periods. See state extension publications and field guides for information on pest biology.

3} *Know the kind of damage the insect causes.* Will it only cause short-term aesthetic damage, or can it potentially kill the plant? Young oak saplings that have been defoliated by caterpillars will usually recover quickly, but an infestation of granulate ambrosia beetles is usually fatal.

4) *Know how and when to scout for insect pests.* It's a lot quicker and easier to look for insect pests than to spray for insect pests that aren't there. Detect pests in the early stages of a population build-up and you can avoid damaging infestations by timely treatment. It's also important to check to be sure that the insects that caused the damage are still there before you spray. Often aphid, mite, or caterpillar infestations have already 'crashed', due to natural biological control, before the damage is noticed. Spraying won't help if they are already gone.

Use Naturally-Occurring Beneficials

Pest insect populations are normally kept in check by naturally-occurring populations of the three Ps: predators, parasites, and pathogens. For any given insect pest, there are usually many different species of predators that feed on that pest, several species of parasitic wasps and/or flies that attack it, and many fungi, bacteria, and viruses that cause fatal infections. Collectively, these naturally-occurring beneficial organisms are our most important defense against pest insects.

It is normal for there to be more pests than predators—there are usually more rabbits than foxes. When severe pest outbreaks occur, it is because the population development of the pest has gotten ahead of the beneficials. Usually, the beneficials will eventually catch up and bring the pest population under control. This does not always happen in time to prevent excessive plant damage, but there are many times when pest insect populations never approach damaging levels because of beneficials.

- *Predators* are animals that eat other insects. Praying mantids are large, general predators that provide little real benefit in controlling pest species. This is also true for most spiders and vertebrate predators, such as birds, lizards, and frogs. It's the smaller, less conspicuous, more host specific predators that provide the greatest pest control benefits. For example, there are hundreds of species of lady beetles; most feed preferentially on soft bodied insects, like aphids and whiteflies. Some species of mites are predatory on plant-feeding mite species.
- *Parasites* are insects that complete part of their life cycle inside, or on, the body of another insect, ultimately causing the death of their insect host. There are thousands of different species of insect parasites. Most are either flies or tiny wasps. Some attack the larval stage of their hosts, while others attack the eggs, pupae, or adults. Most insect parasites are so small and inconspicuous that they are rarely noticed by the average homeowner. Most insect parasites attack only a narrow range of hosts, but most pest insects are attacked by several different species of parasites, and parasitism can have a dramatic effect on pest insect populations. For example, one common parasitic wasp often causes over 80% mortality in aphid populations.
- *Pathogens* are diseases. There are many different types of insect diseases, including different species of fungi, nematodes, bacteria, protozoa, and viruses. Most insect pathogens are quite host specific. Many of these diseases are acutely fatal to affected insects and often cause wide-spread epizootics in susceptible insect populations. Disease outbreaks are more likely to occur in pest populations that have developed to high numbers. One such fungal disease often causes dramatic population reductions of aphid populations; similar fungal outbreaks also occur in spider mites.

Naturally-occurring biological control is cost free. Savy gardeners can take advantage of this free insect control in three key ways.

1} *Avoid unnecessary insecticide use.* Insecticides kill more than just the target pests. They can also kill predators and parasites that help control insect pests. Unnecessary insecticide use often triggers subsequent pest outbreaks because the pests thrive when their parasites and predators are eliminated. This phenomenon is often referred to as ‘flaring’ a pest outbreak. “I flared spider mites on my Leyland cypress when I sprayed them with Sevin to control bagworms.”

2} *Choose insecticides that minimize impact on beneficials.* Some insecticides are more target specific than others. Sometimes you have to spray to control an insect population that has gotten out of hand. When possible try to choose an insecticide that will control the target pest(s), but have minimal impact on beneficial insects. Use broad spectrum insecticide like permethrin, acephate, or carbaryl (Sevin) to control bagworms on an ornamental conifer and you are likely to trigger an outbreak of spider mites—because these insecticides kill predatory mites that help keep the pest mites in check. Choose a more target-specific insecticide like spinosad instead. Spinosad works great on caterpillars but is less likely to flare spider mites.

3} *Grow a diverse array of plants to encourage parasites and predators.* Most adult parasitic wasps and flies rely on pollen and nectar for much of their food, and many predatory insects also supplement their diet with nectar. Maintaining a diverse garden with many different species of blooming plants can help encourage naturally-occurring parasites and predators. Most gardeners especially like this approach; it’s an excuse to buy more plants!

“So where can I order some of these beneficial insects to release in my garden?” This is usually not a good idea in the home landscape. Artificial releases of laboratory reared parasites and predators can work quite well in enclosed greenhouse situations where the environment is carefully controlled, but such releases are rarely helpful in outdoor home landscapes. The released insects either: fly away, die because they are not adapted to the environment, or fail to find suitable hosts because the timing is wrong. Naturally-occurring beneficial insects are much more helpful in most home garden situations.

Use Insecticides Properly

Insecticides are useful pest management tools. It is difficult to garden successfully in the South without using insecticides from time to time. Select the right insecticide for the pest of concern and use a suitable method of application to apply that insecticide at the proper time and rate, and you can stop a threatening pest population from causing excessive damage. Rely on insecticides as your primary method of managing all potential insect pests and you will stay busy spraying, yet still experience disappointing results. Following are some key points that gardeners should keep in mind regarding successful use of insecticides in the home landscape.

1} *Treat preventively when necessary and appropriate.* There are some specific situations where preventive insecticide use is more effective, and results in less total insecticide use, than waiting for the pest population to reach damaging levels and then trying to control it. Don’t hesitate to use preventive control in those situations where knowledge and experience has taught you it is appropriate. Some pest problems re-occur on the same plants every year. Gardenias are often plagued by whiteflies, and heavy infestations of whiteflies are very difficult to control with foliar sprays. A preventive soil-applied application of a treatment containing the active ingredient imidacloprid is easier to apply, and much safer and less damaging to beneficial insect populations, than trying to control whiteflies with foliar sprays. Granular fire ant baits are highly effective, but they must be applied preventively because they are slow-acting. Because they contain only small amounts of growth regulators or slow-acting insecticides, granular fire ant baits are safer and less disruptive than treating individual mounds with contact insecticides.

2) *Scout for pests and treat promptly if necessary.* Develop the habit of checking your plants for insects and diseases while weeding, pruning, or performing other gardening chores. Learn to know which plants are most likely to have problems at certain times of the year. If you detect an insect population that seems to be growing toward damaging levels, go ahead and treat. Don't wait for them to build to high numbers and cause serious damage. It usually takes fewer sprays to control a low to medium pest population than to control outbreak numbers. Also, by detecting and treating building pest populations early, you will prevent much of the damage they would do otherwise.

3) *Treat only infested or susceptible plants.* Don't spray every plant in the landscape just because the azaleas need spraying for lace bugs. And if the lace bugs are only on that planting growing out in full sun, just spray those. Remember, insecticides can often trigger a pest problem by killing beneficial insects and mites.

4) *Use an effective insecticide.* No insecticide is equally effective on all pests. Some insecticides work better on sucking pests, others work best on beetles, and still others work best on caterpillars. Some pests develop resistance to insecticides that once provided good control. Also, some insecticides provide longer residual control than others, and this is often important. Take care to choose an insecticide that will work well on the target pest. In most cases, an insecticide needs to provide at least 90% control to be effective. Check current extension insecticide recommendations.

5) *Use soil-applied systemic insecticides when appropriate.* Because they are not applied as foliar sprays, soil-applied systemic insecticides, such as imidacloprid and dinotefuran, are generally less disruptive to predators and parasites. These products usually work best on sucking pests, such as aphids, whiteflies, and scales. However, they do have a tendency to flare (cause a dramatic population increase) spider mites. Because soil-applied systemic insecticides are slow-acting, they are best used preventively, or as a follow-up treatment to supplement foliar sprays.

6) *Use more selective insecticides whenever possible.* Some insecticides only work on certain types of pests. These are said to be 'more selective'. For example, products containing spinosad only control caterpillars and a few other pests. Bt products and soil-applied systemic insecticides are also selective. Selective insecticides tend to be less disruptive of natural control than 'broad-spectrum' insecticides.

7) *Use broad-spectrum insecticides when necessary.* Sometimes you need to use the 'shotgun approach'. All of the pyrethroid insecticides (the name of the active ingredient in most pyrethroids ends in 'thrin', as in permethrin, cyfluthrin, or cyhalothrin) are broad-spectrum insecticides. Pyrethroids will control most caterpillars, beetles, and other insect pests, but they don't usually work well on spider mites, and may actually flare spider mites. Insecticides such as acephate, carbaryl, and malathion are also broad-spectrum.

8) *Re-treat at necessary intervals.* Some pests can't be controlled with a single spray, and it is often necessary to re-treat after an appropriate interval. Often this is because immobile stages, such as eggs and/or pupae, are not exposed when the first spray is applied. The follow-up spray is needed to control these pests after they have developed into larvae or adults, which are more exposed to treatments. Failure to apply the follow-up spray at the appropriate time will allow these insects to successfully reproduce. When this occurs, the resulting re-infestation is often more severe than it would have been had you not treated at all because of the adverse effect on predators and parasites. This phenomenon is known as 'pest resurgence'.

9) *Use proper insecticide rates.* The rates given on the insecticide label are based on extensive research results and will usually give over 90% control when properly applied. There is no point in applying more than the maximum labeled rate (If you can kill a bug by smashing it with a one pound brick, there's no point in using a 10 pound brick.). Doing so only increases the various risks associated with pesticide use. Increasing rates above those specified on the label won't compensate for improper application. However, it is important to ensure you are using an adequate rate. Don't use milliliters

when the label calls for tablespoons. If the label calls for 1 tbs/gal of water, applied to 300 square feet, don't try to treat the whole yard with one gallon of spray.

10} *Achieve thorough coverage.* This is one of the most important points in successful insect control. Insecticides can only control an insect pest if they come in direct contact with that pest, or are ingested by the pest. Many pests occur on the undersides of leaves, where they are more difficult to reach with foliar sprays. It takes time and thoughtful, deliberate treatment to obtain thorough coverage. Some insecticides exhibit systemic (absorbed by roots or leaves and moves throughout the plant) or translaminar (absorbed by leaves and moves from top of leaves to bottom) activity, and this can help improve coverage and control. This is why acephate is such a good treatment for azalea lace bugs—it is absorbed by the leaves and moves systemically within the plant.

See the following Mississippi State University Extension Publications for more detailed information on the identification, management, and control of specific insect pests.

Publication 2369, Insect Pests of perennial plants in the home landscape

Publication 2331, Control of Insect Pests in and Around the Home Lawn

Publication 2429, Control Fire Ants in Your Yard

Also see the following publications for information on selecting, planting, and caring for landscape plants.

Publication 666, Selecting Landscape Plants

Information Sheet 411, Fertilizing Ornamental Trees and Shrubs

Information Sheet 204, Pruning Landscape Plants

Information Sheet 965, Transplanting Trees and Shrubs in the Landscape

Cultural Practices That Help Manage Certain Insect Pests

Pest	Plant Attacked	Practice
Aphids	Various Plants	Use a forceful spray of water to dislodge heavy concentrations of aphids from plants. Avoid excessive nitrogen.
Pecan Aphids	Pecans	Avoid planting pecans near the house or in sites where the honeydew from aphids can drip onto patios or parked cars.
Spider Mites	Various Plants	Mist plant foliage, especially undersides of leaves, with a water to encourage fungal diseases that control mites. Avoid excessive nitrogen and avoid potassium deficiency.
Canna leaf roller	Cannas	Cut and dispose of old foliage before new growth begins in the spring. This will eliminate most of the overwintering larvae.
Flatheaded appletree borer	Newly planted trees (especially red maples)	Use trunk wrap on newly planted saplings to protect trunk from sun scald and from egg-laying female beetles. Don't allow brace-wires, trunk wrap, etc to damage bark.
Wood Boring Insects	Trees in landscape	Use mulch, trunk guards, and other protective devices to protect tree trunks from mechanical injury by mowers, trimmers, etc. Keep trees properly watered.
Dogwood Borer	Dogwoods	Avoid planting dogwoods in full sun. For trees already in full sun, avoid pruning lower limbs. Leave them to provide shade to lower trunk.
Pine Beetles	Pine trees	Avoid injury to trunks. Keep trees well watered during periods of drought to increase their ability to defend themselves against beetle attacks.
Azalea Lacebug	Azaleas	Avoid planting azaleas in full sun as this increase susceptibility to azalea lacebugs.
Chinch bugs	St. Augustinegrass	Avoid growing St. Augustine in full sun. When establishing new lawns, avoid susceptible varieties such as Delmar, Jade, Roselawn, Raleigh, and Common.
Spittlebugs	Centipede grass	Avoid excessive water and fertilization. Moist humid conditions favor population build up.
Fall Armyworms	Bermudagrass	Avoid excessive water and fertilization. Newly established lawns are especially susceptible to attack by fall armyworms. Monitor closely.
Bagworms	Various shrubs	Hand remove bags containing caterpillars or overwintering eggs, best done in fall through early spring before eggs hatch.
Scale Insects	Various plants	Prune out heavily infested limbs to encourage new growth and improve coverage with insecticide treatments.
Magnolia Scale	Magnolias	Hand-pick these large scales from small trees before eggs hatch in early summer.
Thrips	Roses	Use structural or plant-based windbreaks to reduce exposure of rose plantings to windblown thrips.
White Grubs	Turfgrass	Avoid excessive accumulations of thatch and organic matter, including organic fertilizers. Minimize stress through proper watering and fertility.
Mole Crickets	Turfgrass	Help grass recover from damage by keeping properly watered and fertilized. Use entomopathogenic nematodes that are specific for mole crickets.
Fall Webworms	Shade Trees	Use long pole with wire hook taped to end to breakup and destroy web tents. Don't try to burn them. This does more damage than the caterpillars!
Termites	Your House	Do not allow leaves, straw, or mulch to accumulate along and against outer foundation wall of house. This can allow termites to enter house.
Bees and Wasp	Gardeners	Learn to check for nests and other signs of activity before pruning or doing other lawn chores. Risk is greatest from mid-summer through fall, because nests are largest then.