Integrated Pest Management for Bonsai

Marty Weiser – January 2014

We all want to keep our bonsai healthy and free of pests. The question is how to do it safely and effectively. This document grew out of comments by Ryan Neil and Michael Hegadorn at the Pacific Northwest Bonsai Convention in Spokane during September 2013. Both discussed using a rotation of 3 insecticides or fungicides to treat those pests. I wrote up some notes in November 2013 after getting some details from Ryan. However, as I prepared to this document for the IEBS meeting I decided that I wanted to take a broader approach.

Integrated Pest Management (IPM) is an approach to pest control that is both effective and as environmentally as safe as possible. The goal is to keep pests under control so they cause minimal damage to the plants using the safest method that works. The modern form was developed 30-40 years ago when the dangers of widespread pesticide use became evident. How can we use IPM for our bonsai?

The first step in IPM is to keep our bonsai healthy. In addition to looking better, a healthy plant will keep most pests in check. Some of the key steps in keeping our bonsai healthy and pest free are:

- **Soil** – A free draining soil that holds and releases moisture and fertilizer as the tree needs it is generally the best option. Materials such as pumice, lava, and Akadama are staples of such a soil mix. Many of us have also used small amounts of horticultural charcoal in our soils. Recent work has shown that using 10 – 20 volume percent charcoal in the soil mix may be beneficial.
- **Air** – Many pests flourish when there is little or no airflow around the trees. This is particularly true of molds, mildews, and other fungal diseases that that like a damp environment. Providing space between trees for airflow is the easiest way to solve the problem. The use of free draining soils is also beneficial.
- **Water** – Keeping our bonsai properly watered minimizes stress on the tree. A free draining mix prevents the soil from becoming soggy. However, it is also critical to not allow the soil to become too dry since it can be very difficult to rewet.
- **Fertilizer** – This is probably the most contentious issues in bonsai culture. Bonsai need nutrients to grow, but too many nutrients can both promote too much growth and even damage the tree. Both organic and inorganic fertilizers can be used and there are strong proponents of both. I believe that Ryan Neil has made a good case organic fertilizers are probably better with the free draining soils that we normally use. They often take time to break down in the soil and become available for the roots to absorb. In addition, they can promote the growth of beneficial soil organisms such as mycorrhizae.

One thing to keep in mind is that nearly all of the available environmental niches will be filled with organisms unless we keep our bonsai in a completely sterile environment. These can be beneficial organisms such as mycorrhizae, ladybugs, lacewings, and parasitic wasps or they can be organisms that damage our bonsai like molds, aphids, and scale.

You have found something you believe is a pest on your bonsai. Don't jump straight to the strong pesticides since those can be damaging to the beneficial organisms as well as the environment (including you). Step back and see if you can apply IPM by doing the following.

- **Identify the pest** – Make sure you know it is a pest and what kind. Different pests require different treatments. An insecticide will not treat a fungus and a fungicide will not treat an insect. There are a few pesticides that contain both a fungicide and insecticide, but they may not be the most effective in all cases.
- **Extent of the infestation** – Is the pest confined to one species in your collection? One tree or even one leaf? You don't have to treat the entire collection if it is confined.

- **Determine the approach** – Can you remove the pest by hand? Can you wash it away or change the environment of the tree so it can fight off the pest on its own? Will an environmentally benign approach like agricultural oil, soaps, or botanical extracts work?

If you determine that an aggressive approach to the pest is necessary it is a very good idea to rotate the use of at least 3 chemicals that are designed to attack that pest. The reason to rotate among 3 chemicals is to prevent the disease from developing resistance or immunity to a particular chemical. Very few chemicals will kill 100% of the disease causing organism so the small number that are left have very little competition as they spread through the plant again. Minor mutations occur as they spread – some are beneficial while most are not. However, the next time the same chemical is applied it leaves behind those that are most resistant. After a few rounds of application you now have evolved a chemically resistant bug – for example Methicillin-resistant Staphylococcus aureus (MRSA) in people.

Fungicides are used to treat the needle cast and blights on pines and spruces as well as the fungus on junipers. For needle casts and blights Ryan recommends a rotation of:

- Chlorothalonil – readily available as Daconil
- Copper ammonium complex – readily available as Liquid copper. These should not be applied within 1 month of the use of horticultural oils.
- Azoxystrobin – Syngenta Amistar – Ryan suggests Heritage W which I believe is the water soluble version, but I could only find Heritage G which appears to be granular

For juniper tip blights and foliar diseases Ryan recommends a rotation of:

- Mancozeb - trade names include Dithane, Manzeb, Nemispot, & Manzane should be available from multiple sources
- Propiconazole - Banner Maxx, Honor Guard PPX, other brands
- Heritage W (see above) or Thiophanate methyl - Cleary's 3336 and some products by Scotts for turf grasses

Michael recommends the use of ZeroTol which is an organic peroxide which is also used as a rinse in food processing to kill bacteria.

Insecticides are used to treat insect infections. Unfortunately, many of them will kill a wide range of insects (not just the pests) as well as birds, fish, and mammals (including us and our pets) so care is needed in their use.

- Malathion – both the chemical and trade name is an organophosphate that is applied directly to the pest.
- Acephate – Orthene is the most common brand of this organophospate. It has both surface and systemic (absorbed by the plant and transported to the pest as it eats the plant) properties.
- Carbaryl – Sevin is the most common brand of this cabamate. This class of chemical generally has a longer residual action that the organophosphates which can be both good and bad since it is quite toxic to bees.
- Imidacloprid – Bayer and Bonide are common forms of this systemic tree and shrub drench. It is a neonicotinoid that is applied to the soil and taken up by the roots. It is active for up to a year in the plant and is highly toxic to bees so it is a poor choice for flowering plants.

References

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