Gift of a rose invites kiss of death

by Ed Berg

I always enjoy those pink wild roses blooming along the roadways at this time of year. They aren't as showy as the $40/dozen cultivated types, but they certainly liven up the countryside. But have you noticed the green roses? The roses on willow bushes? These green roses also occur on the roadways but most folks never notice them at 60 mph.

If you don't believe that roses grow on willows, take a look at the willow bushes along a road or in an abandoned field. You will see last year's dried up brown roses, and the new green roses will be forming during the next several weeks.

Here is the innocent part of my story (the grisly part follows shortly). The willow "rose" isn't a flower at all, it is a "gall" or insect house, which the plant is tricked into building for a small fly (midge) of the Cecidomyiidae (Gall Midge) family. In the spring before leafout time, the gall-maker midge lays an egg on the terminal bud of a willow branch (especially on the common roadside Barclay willows). The egg hatches into a grub (larva) which promptly burrows into the bud.

Keep in mind that plant buds have a "growth spot" (meristem) at the base of the bud where new cells are produced. The new cells are piled on top of old cells to add length to the stem, as a bricklayer would build a tower. (Human beings fortunately don't have meristems - otherwise they would grow from the feet upward or the head downward!)

The gall-maker grub burrows into the meristem and starts eating those tasty new plant cells. This prevents the stem from elongating (i.e., growing). Recall too that the leaves in a leaf bud were formed late last summer, and have been stored all winter in compressed form inside the bud (the plant's version of a Zip drive, so to speak). Each leaf in a bud is a tiny "miniature" waiting to be pumped up with water in the spring.

So, the stem can't elongate when the meristem has been eaten, but the tiny leaves can still expand as they normally do, and the leaves simply come out on top of one another in a pile (called a "rosette"). The leaves are arranged in a circular pattern, because they would normally spiral around a fully-extended stem. (You may never have noticed that leaves spiral around a stem in many plants, i.e., in those with "alternate" rather than "opposite" leaves, but take a look at a willow stem and you will see that the leaves spiral counter-clockwise up the stem.)

After the willow rose has formed, you can split it open with a knife and see the orange grub about 3/16 inch (4 mm) long in the center. Notice that there may be a variety of other insect residents in the gall hotel, but the orange grub is the responsible party.

Now here is the grisly part. If you take the orange grub out with tweezers and dissect it with a needle under a microscope (at least 20 power) you will often see a tiny translucent larva inside the grub (in about half of the grubs). This is a "time bomb," i.e., a larva of a parasitic wasp. This bomb is planted as an egg in May when the midge grub is still lying exposed on the unopened leaf bud. A tiny wasp injects (oviposits) its egg into the midge grub. The wasp egg hatches into the translucent larva, which lies dormant inside the developing orange grub throughout the summer and the following winter. But in the following spring, the wasp egg hatches and the orange grub must surely feel something strange moving in its bowels, as it is being eaten from the inside out. (I used to think cancer was bad, but now…)

After consuming its host in the spring, the wasp matures into an adult about 3 mm long, which tunnels out of the gall and seeks another fat, unsuspecting midge larva on a willow bud.

Fans of the movie "Alien" will recognize the inspiration of the alien implantation theme in this movie. The horror of being eaten from the inside out is not to be missed by Hollywood!

My good friend Dominique Collet of Sterling is a student of gall insects and their parasitic predators, and he has provided the details of this story. Dominique has found two other galls on Kenai Peninsula willows - a swollen stem gall and a beaked gall on branch tips. He has also found about a dozen species of parasitic wasps that attack the gall makers.

Some wasps oviposit their eggs into the eggs or larvae of the host, as described above. Others have long ovipositors (that look like stingers but aren't) which drill through the gall wall, depositing the eggs beside the grub in its chamber. In July and August you can see these latter types as small metallic green (or purple wasps) hovering around willow roses. The females have a long ovipositor tucked under their body and they look pretty scary, but are entirely harmless to human-sized critters.

We probably owe much of our quality of life to parasitic wasps, because they are one of the main gate keepers of the insect world, because they keep insect populations in check. Thousands of species of parasitic wasps have been identified, and some have been employed as biological control agents for noxious insects, such as cabbage white butterflies, the coffee berry borer, and stable flies. If we did not have parasitic wasps for gall midges, Barclay willows would be so heavily infested with willow roses that they would not form flowers and seeds, and would not reproduce. If only we had a good parasitic wasp for the spruce bark beetle!

A final speculation: the humble gall makers may possibly carry the secret of a cure for human cancer. Many gall makers somehow take charge of the host plant's cell reproduction machinery. They make the plant produce a lot of tissue in unnatural shapes (like stems swellings and beaked galls) which become the gall dormitories for the insect offspring. Plain and simple, these galls are tumors: you'd be calling the surgeon if some insect did that to you. If we can figure out how gall insects turn on the plant's cell-making machinery, maybe we can also figure out how to turn it off, and therein might lie a cure for cancer.

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