

Scent of witches'-broom not for the tender-nosed

by Ed Berg

If you have walked through a spruce forest recently, you may have noticed a rather potent sweet smell in the air, quite unlike the fragrant flowers of your garden.

A bit of searching will reveal that the odor is coming from a "witches'-broom" on a spruce tree. These brooms are one to three feet in diameter, and are a thick wad of tangled branches. Right now they are displaying new needles, which are light green in color, and stand out in contrast with the normal dark green needles of the rest of the tree. If you are working in the woods at this time of year, you have probably learned to not sit down and eat your lunch beside a tree with one of these smelly brooms.

When I first noticed the smell of the witches'-broom, it reminded me of an animal cage overdue for cleaning. When my daughter Tanya was little, we had hamsters, gerbils, and guinea pigs, and Tanya was generally a bit slow on the cage cleaning detail.

My first thought was that animals (such as squirrels) were nesting in the witches'-broom and that is why they smelled so bad. After inspecting a few of them, however, I noticed that even the new brooms with too few branches for a nest smelled equally bad, so I eliminated the dirty nest hypothesis. After watching the brooms for several years I found that they only smell bad for a few weeks in the spring.

Witches brooms are cancer-like growths caused by a rust fungus (called spruce broom rust or *Chrysomyxa arctostaphyli*) which has a remarkable two-phase life-cycle. If you look at the needles of broom rust with a magnifying glass, you will see yellow dots. These dots will turn dark, and then release tiny spores, just like a mushroom. The spores will be dispersed by the wind, and some will land on kinnikinnick (bearberry, *Arctostaphylos uva-ursi*), whose dark berries on sprawling vines are well-known to fall berry pickers.

The spores will infect the bearberry leaves, although you would never notice this unless you were looking for it. Infected leaves have an orange-brown powder on the underside, which is the second type of spores in the rust life cycle.

The remarkable aspect of this life cycle is that both hosts are required to complete the cycle. A witches'-

broom on a spruce tree cannot infect other spruce trees; it has to first infect a bearberry vine. The bearberry has to produce its spores to infect more spruce.

Likewise, one bearberry vine cannot infect another bearberry vine; it has to go through the spruce stage. This is called an "obligate" relationship because the cycle only works when both partners are available.

There are many examples of these obligate partnerships in nature. I remember as a teenage applying (unsuccessfully) for a job with the Forest Service in Idaho fighting the white pine blister rust, which kills a lot of white pine in the western states.

The alternate hosts of the blister rust are currants and gooseberry bushes (all of the genus *Ribes*), and for years crews of strong young backs were hired to go through the woods and chop out the currants and gooseberries. I think this program has long since been abandoned because it was simply impossible to get rid of all the bushes. If we were concerned about witches'-brooms, we could be sending kids out in the woods to chop out the bearberry.

Fortunately, witches'-brooms are not a major threat in Alaska. If you don't like looking at them, it is fine to saw off the branches with the brooms. I don't recall ever seeing a tree so loaded with brooms that its life was threatened.

Spruce needle rust (*Chrysomyxa ledicola*) is another example of an obligate partnership. You may have seen twigs on spruce trees whose new needles turn bright yellow-orange in the summer. If you flick the twig, a cloud of yellow "smoke" (spores) will appear. This rust has Labrador tea (*Ledum*) as an alternate host.

There were localized occurrences of needle rust around Kenai several years ago. Again, this is worrisome to see on your trees, but it doesn't generally kill the trees. The outbreaks usually occur for only one year, especially with cool damp weather, so the trees are not affected from year to year.

If you really wanted to get rid of it, it would probably be necessary to remove all Labrador tea bushes within 1,000 feet of your spruce trees, according to Forest Service plant pathologists.

I am still puzzling about the weird smell of the

witches'-broom. Some smells in nature have important adaptive value: flowers attract pollinators to aid fertilization, and plants with good-smelling fruits get their seeds dispersed by whoever eats the fruit.

Spruce bark beetles emit attracting and repelling odors (pheromones) to regulate the numbers of beetles attacking a tree. So, what does the witches'-broom accomplish with its aroma?

Probably nothing, as best I can tell. Its spores are distributed by the wind—no critters are required. Ap-

parently, some volatile compound is involved in the spore production process, but it's probably just an accident of the way our noses work that we find it so smelly.

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