Sex and Powdery Mildew in the Hop Yard

- The sexual stage of powdery mildew does not yet occur in the Pacific Northwest, but does occur in other areas of the U.S. and Europe
- Introduction of new strains of the fungus would have immense implications for how well powdery mildew could be controlled
- Strict adherence to relevant quarantine measures is essential to keep out new strains that may lead to the sexual stage

Most of you are reading this article because the title caught your attention. Yes, powdery mildew is that big of a deal. The fungi that cause powdery mildew survive winter or other periods of unfavorable conditions by two means: as hardy overwintering structures called “cleistothecia” (sometimes referred to as chasmothecia) and/or on living host tissue. The difference between the two modes of survival has massive implications for disease management, as we describe below.

Cleistothecia are the result of sexual mating of two compatible powdery mildew strains--procreation in the hop yard. This is the norm for nearly every powdery mildew that has been studied, including the powdery mildew fungus on hop. Cleistothecia allow the fungus to persist winter apart from a living hop plant, so that crop debris infested with cleistothecia can become an inoculum source of in the spring. The pathogen literally becomes seeded everywhere that cleistothecia were produced the previous season. With cleistothecia, epidemics initiated by millions of spores per acre instead of a few, localized infections per yard, the "norm" in regions were flagshoots are important. Diseased cones become even more unsightly. The fungus also tends to be much more adaptable when it reproduces sexually. Millions of new combinations of genes are created in offspring each year, increasing the likelihood that new strains will emerge that are capable of overcoming currently resistant varieties or more quickly developing resistance to fungicides.

Fortunately, the sexual stage of hop powdery mildew has not been documented to occur in the Pacific Northwestern U.S. because of quarantine measures and maybe a little serendipity. The sexual stage has been documented in New York State, Europe, and other regions where powdery mildew occurs on hop. The Pacific Northwest may be the only hop production area in the world where powdery mildew occurs but the sexual stage is not found. Therefore, the fungus must survive winter on live hop tissue. Crown buds are the only tissue in hop yards that provide this medium. The result is that a relatively small number of flag shoots are formed and these can largely be eliminated by hill pruning in winter and spring (see the companion article below).

This is a huge benefit for management since we are dealing with a pathogen that is severely limited in its survival and can’t mate.

Let’s keep it that way.

Closely adhere to all local, state, and national quarantine measures for importing and moving rootstock and planting materials. The difference for you and the industry could be immense.

A hop cone in Germany bearing cleistothecia, which appear as small, reddish-brown flecks. This phase of powdery mildew is not known to occur in the Pacific Northwest.