



Parasites for Christmas

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The Christmas season is rapidly approaching, and we will soon be decorating our homes with evergreens, candles, holly, parasites, and candy canes. Whoa! Did you say parasites? That's right – but I'm not referring to those overbearing relatives who don't know when they've overstayed their welcome, or even to scourges such as malaria or the intestinal protozoan, *Giardia*. The parasite that plays a part in many yuletide celebrations is mistletoe.

Mistletoe is a general name for plants in the Mistletoe family (Viscaceae) that grow attached to the branches of a variety of host species. These plants have evergreen leaves and their stems dichotomously fork and appear to be jointed due to constrictions at the nodes. Mistletoes produce sticky white berries, each with a single seed, that are enjoyed by birds which deposit the seeds in their droppings on a potential new host. The seeds can also adhere to the bird's beak and are then planted in the bark of a branch when the bird tries to dislodge the sticky hitchhiker. When the seed germinates, a root emerges and burrows into the stem of the host where it develops into a haustorium. This root-like structure anchors the parasite and serves as a conduit through which the parasite can steal water, minerals, or nutrients from its host.

Our Christmas mistletoe comes primarily from two species, *Viscum album*, which is the mistletoe of Europe, and *Phoradendron leucarpum* which is native to the US. These plants obtain water and minerals from their host, but they have green, chlorophyll-filled leaves that, via photosynthesis, supply the majority of their nutritional needs. There are over 20 species of *Phoradendron* in the southern and western

United States, but none live in Minnesota. In fact, the only mistletoe that occurs in the state is Eastern dwarf mistletoe (*Arceuthobium pusillum*). Unlike the Christmas mistletoes, these small, pale-colored plants are unable to produce sufficient food for themselves by photosynthesis, so they rely on their host for food as well as water. Dwarf mistletoe typically grows on pines and has been reported in a few counties in northern Minnesota. Fortunately, our extensive conifer stands in the St. John's Arboretum seem to have been spared from this parasite that can significantly reduce the health and timber quality of the host plant.

Although there aren't records of either Dwarf or Christmas mistletoes in the CSB/SJU Bailey Herbarium, the St. John's Arboretum is home to several other parasitic plants including Indian paintbrush (*Castilleja*), Lousewort (*Pedicularis*), and Bastard toadflax (*Comandra umbellatum*). Like the Christmas mistletoes, these species are green and make their own food. In contrast, they don't grow on the stem of their host, but rather, these species send haustoria into the roots of the host and appear to be rooted in the soil. Unless you performed a painstaking excavation of their root system, you wouldn't even know that these attractive plants are water and mineral thieves.

Today, mistletoe is used medicinally, especially in Germany, to treat a variety of conditions including hypotension and cancer. The active ingredients are poisonous proteins (phoratoxins and viscotoxins) as well as cytotoxic glycoproteins (lectins). Studies have not conclusively demonstrated the efficacy of mistletoe, but because of its high toxicity, mistletoe tea or other preparations are definitely not recommended for home use.

The Druids considered mistletoe a sacred and divine plant with great spiritual powers to ward off evil. These ideas were probably derived from mistletoe's ability to remain green throughout the winter and because mistletoe seemingly grew in the sky without a connection to the ground. Druid priests dressed in white robes harvested mistletoe with golden sickles. To pay homage to the spirits, the harvest was accompanied by the sacrifice of two bulls. The severed plants were caught by virgins and then distributed to homes where a sprig was hung above the doorway to ward off evil. According to Christian legend, mistletoe was once a normal forest tree. However, after it was used to make the Cross on which Jesus was crucified, mistletoe shrank in shame to its current growth form.

But what about parasites at Christmas? Mistletoe is hung in a doorway or other prominent location where a young man can sneak a kiss from an unsuspecting maiden who stands beneath it. This practice originated in Britain, though the reason it began remains a mystery. It may be derived from a Norse legend

about Queen Frigga, wife of Odin, who dearly loved her son Balder. She asked all the plants, animals, and non-living things of the world to protect her beloved son, but unfortunately, she neglected mistletoe. Loki, an evil god, was jealous of his archenemy's invincibility so he fashioned an arrow from the wood of mistletoe, and it was used to slay Balder. In the sweetened version of the story, Frigga brought him back to life with a kiss. In her joy she decreed that mistletoe would never again hurt anyone and that all who pass under it should receive a kiss as a token of love. The most highly prized mistletoe has numerous white berries that, according to this legend, represent the silvery tears shed by Frigga for her son. After each kiss, one berry is removed – once gone, no more kisses are permitted.

If you decorate your home with a sprig of mistletoe this Christmas, just remember that you are following an ancient tradition honoring a parasitic plant. And you could certainly do worse – what if those relatives came to stay instead?

References: The following are just a few of the many terrific reference about parasitic plants:

- Barth, E (1979) *Balder and the Mistletoe. A Story for the Winter Holidays*. Seabury Press, NY.
- Kuijt, J (1969) *The Biology of Parasitic Plants*. Univ. of California Press, Berkeley.
- Nickrent, DL (2002) "Parasitic Plants of the World." Chapter 2, pp 7 – 27 in JA Lopez-Saez, P Catalan and L. Saez [eds] *Parasitic Plant of the Iberian Peninsula and Balearic Islands*. Mundi-Prensa, Madrid.

