

6.2 Effects of different humidity regimes on disease development

Different humidity regimes produce clear differences in cucumber disease development, but the response depends on the pathogen and its interaction with temperature and leaf wetness. For cucumber downy mildew, sporangial germination and infection are favored by very high humidity, with infection commonly requiring relative humidity above 90% for several hours, and greenhouse observations showed that maintaining humidity below about 89% sharply reduced disease incidence and severity (Khudhair and Aljarah, 2023). Controlled-environment work supports this threshold behavior: downy mildew lesions produced abundant sporangia under leaf wetness or 100% RH, but only a few at 90% RH, and the minimum wetness duration needed for infection varied strongly with temperature.

Other cucumber pathogens show related but not identical humidity responses, which means that humidity targets should be set for multi-disease suppression rather than a single disease alone. For target leaf spot, maximum spore production occurred at 100% RH and moisture explained most of the variation in spore size, while larger spores were more virulent, indicating that saturated air not only increases inoculum quantity but can also increase its aggressiveness (Zhao et al., 2022). For powdery mildew, by contrast, intermediate RH of 50%-70% optimized disease development, while low RH of 20%-40% reduced lesion growth and short daily exposure to 35°C suppressed disease development by 70%-92%, showing that not all foliar pathogens peak under the same humidity regime (Figure 2) (Saad and Khalifa, 2021).

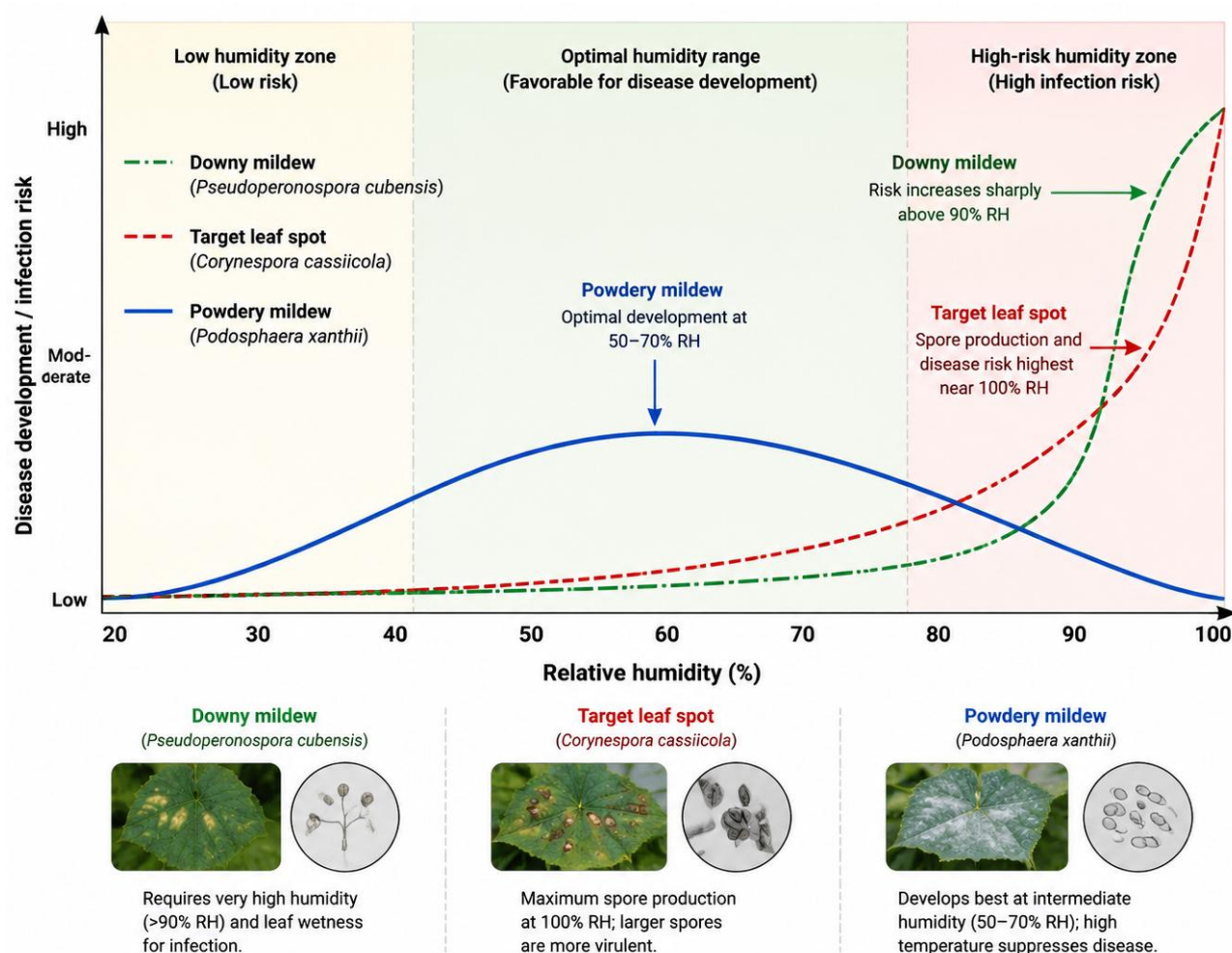


Figure 2 Conceptual humidity-response patterns of major cucumber foliar diseases. Different pathogens exhibit distinct humidity-sensitive infection windows, with downy mildew and target leaf spot showing increased disease risk under near-saturated humidity, whereas powdery mildew develops optimally under intermediate relative humidity conditions