

## Abstract

Disease management may require multiple decisions by growers on whether to apply a pesticide, the frequency of applications, and also the type of pesticide to use. We developed models for estimating the probability of switching behavior by hop growers related to use of non-synthetic or synthetic fungicides, or mixtures thereof, for hop powdery mildew (*Podosphaera macularis*). Growers used non-synthetic fungicides alone in 61.5\% of their applications, later switching to synthetic fungicides or mixtures of the two in 21.5\% or 17.0\% of their total applications, respectively. Binary logistic regression predicted that the likelihood of switching fungicide type was associated with use of a nonsynthetic fungicide in the first application of the year and how early in the season growers made that application. The predicted probability of switching increased proportionate to the incidence of plants with powdery mildew, but with a weaker effect. Multinomial logistic regression modeling of switching between non-synthetic, synthetic, or mixtures of fungicides indicated a complex pattern of switching behavior. A random forest classification algorithm identified the most important variables in the multinomial logistic regression model as time of year, individual grower effects, the date of the first application, seasonal mean disease incidence, thoroughness of spring pruning, and cultivar susceptibility to two races of the fungus. Overall, our analyses indicate that growers switch from nonsynthetic fungicides to more active (and more expensive) synthetic fungicides or mixtures thereof at critical periods of crop susceptibility and when expected or observed disease incidence increases. Reducing use of synthetic fungicide inputs may be closely linked to disease risk mitigation, as risk mitigation is indissolubly linked to growersâ decision to switch to these more potent fungicides or fungicide mixtures. }