

Effective and Economical Management of Flower, Foliar, and Fruit Diseases of Cling Peach

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Introduction. Major flower, foliar, and fruit diseases of cling peach include peach leaf curl, shot hole, brown rot, powdery mildew, and rust. Each has its own unique biology and life cycle. Still some of these diseases have temporal overlapping disease cycles, affecting vulnerable host stages. Infections may result during these periods that establish pathogens on the host for later epidemics or they may cause direct crop damage by infecting flowers or fruit. Thus, management strategies can often be timed for obtaining maximum impact of control measures by targeting more than one disease. The goal for growers is to not only develop the most effective but also the most efficient and cost-effective disease management program. The key is to select the best fungicide product with the broadest spectrum of activity against these pathogens and time the application at a critical stage.

Registered and new fungicides. Fungicides are the most effective and safe way for managing diseases of cling peach. Fortunately, there are numerous choices because multiple fungicides with different modes of action (MOA) are registered for each disease. This may appear to make a decision more difficult, but having multiple active ingredients available allows for competitive pricing, development of highly effective management programs that target problematic diseases at individual orchard sites, and resistance management. The UC IPM web site (<http://www.ipm.ucdavis.edu/PDF/PMG/fungicideefficacytiming.pdf>) lists materials available, their MOA, chemical properties, their efficacy against selected diseases, timing of application, and modules to develop disease management programs. In recent years, many active ingredients have become available as generic products under different trade names. This has further increased the complexity but also allows for reducing fungicide costs to the grower.

Effective fungicides and their application timing. Annual disease management programs for cling peach can be developed for efficacious and cost-effective disease control. Critical periods for management practices to be implemented can be identified as: 1) Dormant; 2) Bloom; 3) Petal Fall (to Pit Hardening); and 4) Preharvest. Table 1 shows the critical periods for managing the major diseases of cling peach as described above. Each period can be sub-divided into a “follow-up” period if environmental conditions are favorable for disease development. The approximate time period is indicated by the months and host stage. The fungicides are listed by FRAC (Fungicide Resistance Action Committee) Group No., and numbers separated by a slash are tank- or pre-mixtures of two active ingredients representing different MOA. For examples, three levels of disease pressure are provided – Low, Medium, and High.

Under low disease pressure (in orchards with low disease levels and low rainfall conditions), a maintenance program of four fungicide applications should be sufficient to effectively manage the major diseases (Table 1). Products suggested are examples and can be replaced with others from the column listing “Effective Fungicides”. In this example, a single dormant application of an M3 fungicide can provide highly effective management of peach leaf curl; whereas a single delayed-bloom application at ca. 40% open flowers can prevent an outbreak of brown rot. Similarly, a single application during the petal fall period and a single preharvest fungicide application may be all that is needed to ensure low levels of disease.

In medium disease pressure years and in orchards with a history of moderate disease incidence, additional fungicide applications may be needed during periods of high rainfall. In this case, high rainfall is occurring in the dormant and bloom periods and thus, two applications each are suggested (e.g., 1A/1B and 2A/2B); whereas only one application is suggested for each of the remaining management periods. In the unlikely scenario for California that high rainfall occurs throughout the year, two applications of fungicides are shown for each management period while still limiting the total number of applications of each FRAC Group to no more than two per season (Table 1).

Table 1. Management of multiple flower, foliar, and fruit diseases under three levels of disease pressure over four periods of host susceptibility using fungicides and resistance management practices.								
Disease ^a	Management Period ^b			Effective Fungicides (FRAC Group No.)	Disease Pressure			
	No.	Month	Host Stage ^c		Low	Medium	High	
PLC, SH	1A	Nov.-Dec.	Dormant	M2, M3, M5	M3	M3	M3	
	1B	Jan.	Delayed Dormant	"	---	M2	M2	
BRBB, PM	2A	Feb.-Mar.	Pink Bud	2/7, 2/13, 3, 3/7, 3/9, 3/11, 3/17, 7, 7/11, 9/13	---	2	2	
	2B		Full Bloom	"	7/11	7/11	2/13	
PM, Rust	3A	Apr.-May	Petal Fall	3, 3/7, 3/11, 3/13, 7, 7/11, 11	3/13	3/7	3/13	
	3B		Pit Hardening	"	---	---	7/11	
BRFD	4A	July-Sept.	FR - 14 day PHI	3, 3/7, 3/11, 7/11	3	3/11	3	
	4B		FR - 7 day PHI	"	---	---	7/11	
Total Applications					4	6	8	

^a - Diseases: peach leaf curl (PLC), shothole (SH), brown rot blossom blight (BRBB), powdery mildew (PM), rust, and brown rot fruit decay (BRFD).

^b - Periods critical for implementing disease control measures.

^c - Host stage: FR = fruit rot; PHI = preharvest interval.

^d - Disease pressure: Low - low rainfall in each of the four critical periods; Medium - high rainfall in winter and spring; and High - high rainfall in each of the four critical periods. Low pressure is assuming that the orchard history has low disease.

The examples given are generalized guidelines. Growers should consult with qualified pest control advisors and monitor their orchards for diseases during the year. Micro-climates also exist for some orchard sites that may be more conducive for disease and thus, require more intense monitoring and disease management practices to be successful. Additionally, not all orchards have all of these diseases. Some varieties are more susceptible to powdery mildew than others and if scouting is being done, management practices for mildew and rust in period 3A/3B may not be needed.

Anti-resistance- principles and practices. To prevent the selection of resistance, the goal is to integrate and rotate between the different MOAs and thus, limit use of any one group to a minimum number in each growing season. This will optimize disease control while preventing the selection of resistant sub-populations of the pathogens. The primary goal is to “Minimize pathogen survivors” while not compromising disease control. Minimizing or using off-label, low

rates or limiting coverage (e.g., alternate row spray applications) are the two most common practices that lead to problems. Fungicide users should follow the “**RULES**” of resistance management:

- **R**otate between fungicides of different MOA, or simply between FRAC Group numbers
- **U**se label rates and provide complete coverage to minimize pathogen survival and escapes
- **L**imit the number of applications of any one fungicide MOA to a minimum of one or two per season.
- **E**ducate yourself about fungicide efficacy, spectrum of activity, MOA (FRAC group), and best usage strategies (<http://www.ipm.ucdavis.edu/PDF/PMG/fungicideefficacytiming.pdf>), resistance management practices, as well as the disease cycles of the pathogens involved.
- **S**tart disease management programs with broad-spectrum, multi-site MOA fungicides to reduce the total number of individuals of the pathogens (spores).