



## Have You Developed a Fungicide Resistance Management Program?

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Fungicide resistance has developed in the powdery mildew and downy mildew fungal populations in many grape growing regions to the point where the use of sterol inhibiting fungicides or the strobilurin fungicides no longer provide acceptable management of one or both of these diseases.

*It is not a question of 'if' fungicide resistance will develop but 'when'.*

Let us learn from the experience of other grape regions and use the fungicides that have a high risk for resistance in ways that will extend their 'effective life' as long into the future as possible.

The classes/families/groups of fungicides that are considered to have a high risk for resistance development include the sterol-inhibiting fungicides such as Rally, Elite, Procure, Rubigan, Vintage; strobilurin fungicides such as Sovran, Flint, Abound; anilinopyridine fungicides such as Scala Vanguard; phenylamide fungicides which include Ridomil products; and dicarboximide fungicides such as Roval. In general, if resistance develops in a pathogen population to one of the fungicides within the fungicide class/group, the other fungicides within that class/group will also not be effective.

There are some basic rules for extending the 'effective life' of high risk fungicides. These include:

(1) Limit their use. Check the label for the maximum times they can be applied and try to use less than that number. For example, sterol-inhibiting fungicides should only be used a maximum of 3 times per year; strobilurin fungicides should be applied no more than 2 times a year. Note that a potential "benchmark" to keep in mind is that after 15 to 20 applications of a strobilurin fungicide, powdery mildew resistance can be expected. Downy mildew resistance is also a risk with repeated use of strobilurins. Use high risk fungicides when you get the biggest "bang for the buck" at critical disease management times and when a lower risk fungicide will not do the job.

(2) Use lower risk fungicides where appropriate. If using high risk fungicides, alternate with those that have lower risk of fungicide resistance. For example, sulfur is a low risk fungicide for powdery mildew management on sulfur-tolerant varieties; mancozeb and captan are low risk fungicides effective against downy mildew. Note: Phosphorous acid products (Phostrol, Prophyt) are considered to have a moderate risk for downy mildew resistance development.


(3) Apply at recommended rates and spray intervals.

(4) Make sure you obtain good coverage when you spray.


Note: There are some fungicide products that are actually a combination of two fungicides. If a sterol-inhibiting fungicide or strobilurin is in the mix, they should be counted in the total number allowed per year per fungicide class/group. For example, Adament includes both a sterol inhibitor and a strobilurin, each of which would be counted toward the 3 application and 2 application limit per year, respectively. Pristine includes a strobilurin which would count in the 2 application limit recommendation.

The **FRAC Code** and managing fungicide resistance - The [Fungicide Resistance Action Committee](#) (FRAC) is a group of professionals who work "to prolong the effectiveness of fungicides liable to encounter resistance problems and to limit crop losses should resistance appear". They provide fungicide resistance management guidelines to prolong the effectiveness of "at risk" fungicides. FRAC has grouped and coded fungicides (i.e., FRAC Code) as to their site-specific mode of action and whether they share the same resistance problems across members of the group (cross resistance). An example of a part of a fungicide label with the FRAC Code appears below. This information can be used to help select fungicides that have different modes of action.

**FRAC CODE**



GROUP	11	FUNGICIDE
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**Flint<sup>®</sup> Fungicide**

For control of certain diseases using foliar applications on asparagus, cucurbit vegetables, fruiting vegetables, grapes, grasses grown for seed, hops, leafy petiole vegetables, pome fruits, root vegetables (except radishes), strawberries, and tropical crops.

Active Ingredient:		
Trifloxystrobin .....	50.0%	
Other Ingredients: .....	50.0%	
		100.0%

EPA Reg. No. 264-777 EPA Est.

**STOP - Read the label before use**  
**KEEP OUT OF REACH OF CHILDREN**  
**CAUTION**

For a more thorough review of factors that impact the development of fungicide resistance please see: [Fungicide Resistance Management](#) by John Damicone and Damon Smith, Oklahoma Coop. Ext. Service, EFF-7663-8



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Where trade names or commercial products are used for identification, no discrimination is intended and no endorsement is implied. Always read the label before using any pesticide. **The label is the legal document for the product use. Disregard any information in this article if it is in conflict with the label.**  
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