ALMOND: FUNGICIDE EFFICACY

Fungicide	Resistance risk (FRAC)[1]	Brown rot	Jacket rot	Anthrac -nose	Shot hole	Scab[3]	Rust[3]	Leaf blight	Alternaria leaf spot [3]	PM-like[5]	Hull rot[16]
Bumper,Tilt,Propicure, Propiconazole[4]	high (3)	++++	+/-	++++	++	++	+++	ND	++	+++	++
Fontelis[4]	high (7)	++++	++++	++	++++	+++	+++	ND	+++	ND	----
Kenja[4]	high (7)	++++	++++	++	++++	+++	+++	ND	+++	ND	----
Indar	high (3)	++++	+/-	+++	++	++	NL	ND	+	ND	----
Inspire	high (3)	++++	+	+++	++	+++	+++	ND	+++	ND	+++
Inspire Super[4]	medium (3/9)	++++	++++	ND	+++	+++	+++	ND	+++	ND	+++
Luna Experience[3]	medium (3/7)	++++	+++	++++	+++	++++	++++	ND	++++	+++	+++
Luna Sensation[3,7]	medium (7/11)	++++	++++	++++	++++	++++	++++	ND	++++	+++	+++
Merivon[3,7]	medium (7/11)	++++	++++	++++	++++	++++	+++	ND	++++	++++	+++
Pristine[3,7]	medium (7/11)	++++	++++	++++	++++	++++	+++	ND	+++	+++	+++
Quadris Top[3]	medium (3/11)	++++	NL	++++	+++	++++	++++	ND	+++	+++	+++
Quilt Xcel,Avaris 2XS[3]	medium (3/11)	++++	+++	++++	+++	++++	++++	ND	+++	+++	+++
Quash[4]	high (3)	++++	++	++++	+++	+++	++++	ND	++++	+++	+++
Rovral + oil[8, 9]	low (2)	++++	++++	----	+++	+/-	++	ND	+++	ND	----
Scala[3, 7]	high (9)	++++	++++	ND	++	----	ND	ND	+	----	----
Tebucon,Toledo (Elite**,Tebuzol**)	high (3)	++++	+/-	+++	++	++	+++	ND	+	ND	++
Topsin-M,T-Methyl, Incognito,Cercobin[2,6,7,8]	high (1)	++++	++++	----	----	+++	+	+++	----	++	----
Vangard[3, 7,9]	high (9)	++++	++++	ND	++	----	ND	ND	+	----	----
Viathon	medium (3/33)	++++	+/-	+++	++	++	+++	ND	+	ND	++
Abound[3,4,7,10]	high (11)	+++	----	++++	+++	++++	++++	+++	+++	+++	+++
CaptEvate*	low (M4/17)	+++	+++	+++	+++	+++	----	+++	+	----	----
Elevate[7]	high (17)	+++	++++	----	+	ND	ND	ND	ND	ND	----
Gem[3,4, 7, 10]	high (11)	+++	----	++++	+++	++++	++++	+++	+++	+++	+++
Laredo	high (3)	+++	----	++	++	----	+	+++	----	+++	----
Luna Privilege	high (7)	+++	++	++	++	+++	+++	ND	+++	++	++
Rovral,Iprodione, Nevado[9]	low (2)	+++	+++	----	+++	----	----	ND	++	----	----
Rally[13]	high (3)	+++	----	++	+/-	----	+	+++	----	+++	----
Rhyme	high (3)	+++	+/-	ND	+	++	ND	ND	++	ND	ND
Bravo,Chloro-thalonil,Echo,Equus[11, 12, 15]	low (M5)	++	NL	+++	+++	+++	++++	NL	NL	----	----
Captan[4, 6, 12]	low (M4)	++	++	+++	+++	++	----	+++	+	----	----
Fracture	low	++	+	----	----	----	----	----	----	----	----
Mancozeb	low (M3)	++	++	+++	+++	++	+++	+++	+	----	----
Ph-D	medium (19)	++	+++	----	++	+++	+++	ND	++++	ND	+++
Ziram	low (M3)	++	+	+++	+++	+++	----	++	+	----	----
Syllit	medium (U12)	+	----	ND	+++	++++	ND	ND	+	ND	----
Copper[14,15]	low (M1)	+/-	+/-	----	+	+	----	----	ND	----	----
Lime sulfur[12,15]	low (M2)	+/-	NL	----	+/-	++	++	NL	NL	----	----
Sulfur[4,12]	low (M2)	+/-	+/-	----	----	++	++	----	----	+++	----
PlantShield[17]	low	----	----	----	----	----	----	----	----	----	----
Copper + oil[14,15]	low (M1)	ND	ND	----	+	+++	----	----	ND	----	----

Rating: ++++ = excellent and consistent, +++ = good and reliable, ++ = moderate and variable, + = limited and/or erratic, +/- = minimal and often ineffective, ---- = ineffective, NL = not on label, and ND = no data

*** Registration pending in California.**

****Not registered, label withdrawn or inactive in California.**

[1] Group numbers are assigned by the Fungicide Resistance Action Committee (FRAC) according to different modes of actions (for more information, see http://www.frac.info/). Fungicides with a different group number are suitable to alternate in a resistance management program. In California, make no more than one application of fungicides with mode-of-action Group numbers 1, 4, 9, 11, or 17 before rotating to a fungicide with a different mode-of-action Group number; for fungicides with other Group numbers, make no more than two consecutive applications before rotating to fungicide with a different mode-of-action Group number.

[2] Strains of the brown rot fungi *Monilinia laxa* and *M. fructicola* resistant to Topsin-M and T-Methyl have been found in some California almond orchards. MBC-resistant strains of the jacket rot fungus, *Botrytis cinerea* and powdery mildew fungi, have been reported in California on crops other than almond and stone fruits and may have the potential to develop in almonds with overuse of fungicides with similar chemistry. MBC-resistant strains of the scab fungus, *Fusicladium* (*Cladosporium*) *carpophilum*, have been found in California.

[3] Field resistance of *Alternaria* sp. and *Fusicladium carpophilum* to QoI and SDHI fungicides has been detected in almond orchards. AP-resistant populations of *Monilinia* spp. have been found on other stone fruit crops in California.

[4] Of the materials listed, only sulfur, Abound, Gem, and some of the DMI fungicides (FRAC Group No. 3) are registered for use in late spring and early summer when treatment is recommended.
[5] PM-like refers to a powdery mildew-like disease on almond fruit that is managed with fungicides. Recent information suggests an *Acremonium* species is involved.
[6] Excellent control obtained when combinations of Topsin-M or T-Methyl and Captan are used.
[7] To reduce the risk of resistance development, start treatments with a fungicide with a multi-site mode of action; rotate or mix fungicides with different mode of action FRAC numbers for subsequent applications, use labeled rates (preferably the upper range), and limit the total number of applications/season.
[8] Oils recommended include "light" summer oil, 1-2% volume/volume.
[9] Not registered for use later than 5 weeks after petal fall.
[10] Efficacy reduced at high temperatures and relative humidity; experimental for Alternaria.
[11] Bravo Ultrex, Bravo WeatherStik, Echo, Echo Ultimate, and Chlorothalonil are currently registered.
[12] Do not use in combination with or shortly before or after oil treatment.
[13] Efficacy is better in concentrate (80-100 gal/acre) than in dilute sprays.
[14] The low rates necessary to avoid phytotoxicity in spring reduce the efficacy of copper.
[15] "Burns out" scab twig lesions when applied at delayed dormant. (Chlorothalonil can be applied with dormant oil during tree dormancy).
[16] Hull rot ratings are for the disease caused by *Rhizopus stolonifer*. Ratings for the disease caused by *Monilinia* spp. will be provided in the future.
[17] Plantshield is best used for wood-exposing wounds to prevent silverleaf and wood decay.

ALMOND: TREATMENT TIMING

Note: Not all indicated timings may be necessary for disease control.

Disease	Dormant	Bloom			Spring[1]		Summer	
		Pink bud	Full bloom	Petal fall	2 weeks	5 weeks	May	June
Alternaria	----	----	----	----	----	++	+++	+++
Anthracnose[2]	----	++	+++	+++	+++	+++	+++	++
Bacterial spot	+	----	++	+++	+++	++	+	----
Brown rot	----	++	+++	+	----	----	----	----
Green fruit rot	----	----	+++	++	----	----	----	----
Hull rot[7]	----	----	----	----	----	----	----	+++
Leaf blight	----	----	+++	++	+	----	----	----
Rust	----	----	----	----	----	+++	+++	+[6]
Scab[3]	++	---	---	++	+++	+++	+	---
Shot hole[4]	+[5]	+	++	+++	+++	++	----	----

Rating: +++ = most effective, ++ = moderately effective, + = least effective, and ---- = ineffective

[1] Two and five weeks after petal fall are general timings to represent early postbloom and the latest time that most fungicides can be applied. The exact timing is not critical but depends on the occurrence of rainfall.
[2] If anthracnose was damaging in previous years and temperatures are moderate (63°F or higher) during bloom, make the first application at pink bud. Otherwise treatment can begin at or shortly after petal fall. In all cases, application should be repeated at 7- to 10-day intervals when rains occur during periods of moderate temperatures. Treatment should, if possible, precede any late spring and early summer rains. Rotate fungicides, using different fungicide classes, as a resistance management strategy.
[3] Early treatments (during bloom) have minimal effect on scab; the 5-week treatment usually is most effective. Treatments after 5 weeks are useful in northern areas where late spring and early summer rains occur. Dormant treatment with liquid lime sulfur improves efficacy of spring control programs.
[4] If pathogen spores were found during fall leaf monitoring, apply a shot hole fungicide during bloom, preferably at petal fall or when young leaves first appear. Reapply when spores are found on new leaves or if heavy, persistent spring rains occur. If pathogen spores were not present the previous fall, shot hole control may be delayed until spores are seen on new leaves in spring.
[5] Dormant copper treatment seldom reduces shot hole infection but may be useful in severely affected orchards and must be followed by a good spring program.
[6] Treatment in June is important only if late spring and early summer rains occur.
[7] Make application at 1 to 5% hull split to manage hull rot caused by *Rhizopus stolonifer*.