

Chemical classes and modes of action of fungicides registered for use on turfgrasses

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Common Name	FRAC ¹	Group Name	Trade Name(s) ²	Topical mode of action ³
azoxystrobin	11	Strobilurin	Heritage 50WG, Heritage TL, Heritage G	Acropetal Penetrant
boscalid	7	Anilene	Emerald 70EG (WDG)	Acropetal Penetrant
captan	M4	Thiophthalimide	Captan 80WP, Captec 4L	Contact
chloroneb	14	Aromatic Hydrocarbon	Terraneb SP, Teremec SP, Andersons Fungicide V, Proturf Fungicide V	Contact
chlorothalonil	M5	Nitrile	Andersons 5% Daconil 5G, ArmorTech 825 DF, ArmorTech CLT 720, ChloroStar 6F, Concorde SST 6F, Daconil 5G, Daconil Ultrex, Daconil WeatherStik, Daconil 2787, Daconil Zn, Echo 720F, Equus 500ZN, Manicure 6F, Manicure Ultrex, Lebanon Daconil 5G, Legend 6F, Pegasus L, Pentathalon	Contact
cyazofamid	21	Cyanoimidazole	Segway	Localized Penetrant
etridiazol (ethazole)	14	Aromatic Hydrocarbon	Koban 30WP, Terrazole 35WP	Contact
fenarimol	3	Demethylation Inhibitor	Rubigan AS	Acropetal penetrant
fludioxinil	12	Phenylpyrrole	Medallion 50WP	Contact
fluoxastrobin	11	Strobilurin	Disarm 480SC	Acropetal Penetrant
flutolanil	7	Carboximide	ProStar 70WP, Moncut 70-DF	Acropetal Penetrant
fosetyl-AI	33	Phosphonate	Autograph, Chipco Aliette, Chipco Signature, Lesco Prodigy Signature, Terra Aliette T&O	Systemic Penetrant
iprodione	2	Dicarboximide	Andersons Fungicide X, ArmorTech IP 233, Chipco 26 GT, Chipco 26019, Iprodione Pro, Lesco 18 Plus, Proturf Fungicide X, Raven	Localized Penetrant
mancozeb	M3	Carbamate	Dithane 37WF, Dithane T/O, Fore Flo-XL 4F, Fore Rainshield 4F, Formec 80W, Junction 61WF, Lesco Mancozeb 75DG, Lesco 4 Flowable Mancozeb 4F, Manzate 200, Pentathlon, Protect DF, WingMan	Contact
maneb	M3	Carbamate	Maneb Plus Zinc F4, Maneb 75DF, Pentathlon 4F (75DG)	Contact
mefenoxam	4	Phenylamide	Andersons Pythium Control 1.2G, Mefanoxam, Quell, Ridomil, Subdue, Subdue MAXX	Acropetal Penetrant
metalaxyl	4	Phenylamide	Subdue2E, Subdue GR, Subdue WSP, Proturf Pythium Control, Apron (seed treatment), Verio	Acropetal Penetrant
metconazole	3	Demethylation Inhibitor	Tourney	Acropetal Penetrant
myclobutanil	3	Demethylation Inhibitor	Andersons Golden Eagle 0.39G, Eagle 20EW, Siskin	Acropetal Penetrant
PCNB	14	Aromatic Hydrocarbon	Andersons FFII 15.4G, Defend 4F, Engage 75W, Fluid Fungicide II, Lesco Revere 4000 4F (10G), Parflo 4F, PCNB 12.5G, Penstar 75WP, Terraclor 400F (75WP), Turfcide 400F (10G)	Contact
phosphites (salts)	33	Phosphonate	Alude 5.2F, Biophos, Fosphite, Magellan 6.69F, Phostrol, Reliant, ReSyst 5F, Vital 4L	Systemic Penetrant
polyoxin D zinc	19	Polyoxin	Endorse 2.5WP, Affirm 11.3WDG	Localized Penetrant
propamocarb HCl	28	Carbamate	Banol 6S	Localized Penetrant
propiconazole	3	Demethylation Inhibitor	ArmorTech PPZ 143, Banner GL 3.6WSP, Banner MAXX, Kestrel, Lesco Spectator 3.6EC, Propiconazole Pro 1.3MEC, Strider	Acropetal Penetrant
pyraclostrobin	11	Strobilurin	Insignia 20WDG	Localized Penetrant
tebuconazole	3	Demethylation Inhibitor	Torque	Acropetal Penetrant
thiophanate-methyl	1	Benzimidazole	Absorb TM, Allban, Andersons Systemic Fungicide 2.3G, ArmorTech TM 462, Cavalier 2G (4.5F, 50WSB), Cleary's 3336 (2G, 4F, 50WSB, 70EG), Fungo Flo 4.5F, Fungo 50WSB, Lesco T-Storm 50WSB, Proturf Systemic Fungicide, Systec 1998 85WDG, T-Bird WDG, Tee-Off 4.5F	Acropetal Penetrant
thiram	M3	Carbamate	Defiant 75WDG, Lesco Thiram 75DG, Spotrete 4F	Contact
triadimefon	3	Demethylation Inhibitor	Accost 1G, Bayleton 50WSP, Andersons Fungicide VII 0.59G, Andersons 1% Bayleton 1G, Lebanon Bayleton 1G, Lesco Systemic Fungicide 50WDG	Acropetal Penetrant
trifloxystrobin	11	Strobilurin	Compass 50WDG	Localized Penetrant
triticonazole	3	Demethylation Inhibitor	Trinity, Triton	Acropetal Penetrant
vinclozolin	2	Dicarboximide	Curalan 4F (50EG, WSB, 50DF), Lesco Touche EG, Vorlan 50DF	Localized Penetrant

Pre-mixed Products (Common Name)	FRAC ¹	Trade Name(s) ²
azoxystrobin + propiconazole	11 plus 3	Headway
chlorothalonil + propamocarb	M5 plus 28	Banol C, Lesco Par,
chlorothalonil + propiconazole	M5 plus 3	Concert, Echo Propiconazole Turf Fungicide
chlorothalonil + thiophanate-methyl	M5 plus 1	Broadside, ConSyst, Spectro, Peregrine
chlorothalonil + fludioxonil + propiconazole	M5 plus 12 plus 3	Instrata
chlorothalonil + triticonazole + stress guard	M5 plus 3 plus ?	Reserve
fluoxastrobin + chlorothalonil	11 + M5	Disarm C
fluoxastrobin + myclobutanil	11 + 3	Disarm M
mancozeb + copper hydroxide	M3 plus M1	Junction
mancozeb + myclobutanil	M3 plus 3	MANhandle
propamocarb + fluopicolide	28 plus 43	Stellar
pyraclostrobin + boscalid	11 plus 7	Honor
thiophanate-methyl + chloroneb	1 plus 14	Proturf Fungicide IX
thiophanate-methyl + flutaloniil	1 plus 12	SysStar
thiophanate-methyl + iprodione	1 plus 2	ArmorTech TMI 20/20, 26/36 Fungicide, Dovetail, Lesco Twosome, Proturf Fluid Fungicide
thiophanate-methyl + mancozeb	1 plus M3	Duosan WP, Dusan WSB
triadimefon + flutolanil	3 plus 7	Prostar Plus
triadimefon + metalaxyl	3 plus 4	Proturf Fluid Fungicide II
triadimefon + thiram	3 plus M3	Proturf Fluid Fungicide III
triadimefon + trifloxystrobin	3 plus 11	Armada
triadimefon + trifloxystrobin + stress guard	3 plus 11 plus ?	Tartan

¹Fungicide Resistance Action Committee Codes (FRAC): fungicides with the same FRAC code have the same mode of action. M-codes indicate multi-site chemicals with low risk of resistance development.

²Trade names are used for identification purposes only, no endorsement is implied, nor is discrimination intended against similar materials. The information has been prepared partially based on M. Bess Dicklow, University of Massachusetts-Amherst. 2006, "Commonly used turfgrass fungicides and diseases they control" and Vincelli, P. and A.J. Powell, University of Kentucky. 2007, "Chemical control of turfgrass diseases 2007."

³Topical Mode of Action:

- Contact fungicides remain on the outside of the plant and protect the plant from new infection. These fungicides do not have curative activity and new growth is not protected. The length of activity is short due to exposure to the environment (rain, traffic, ultraviolet light).
- Localized penetrants form a protective barrier on the plant surfaces and permeate into the plant leaf in the area in which it was deposited. These fungicides have some curative activity, but do not move upward or downward in the plant.
- Acropetal penetrants form a protective barrier on the plant, permeate into the plant, and move upward in the plant's xylem. These fungicides have protective activity including new growth, and have good curative activity.
- Systemic penetrants form a protective barrier on the plant, permeate into the plant, move upward in the plant's xylem, and move downward in the plant's phloem. These fungicides have protective activity including new growth, and have good curative activity.