Chart 1. Susceptibility of Annual Broadleaf Weeds to Herbicides Registered in Grapes in California

	Preemergence													Postemergence									
C = Control P = Partial control N = No control -- = No information	**DICH**	**DIUR**	**FLUM**	**ISOX - NB**	**NAPR**	**NORF**	**ORYZ**	**OXYF**	**PEND - NB**	**PRON**	**SIMA**	**THIA - NB**	**TRIF**	**CLET - NB**	**DIQU - NB**	**FLUA - NB**	**GLUF**	**GLYP**	**MSMA - NB**	**PARA**	**OXYF**	**SETH**	
Annual Broadleaves																							
Ann. morninglories	C	C	C	C	P	C	P	C	N	-	C	-	C	N	P	N	C	C	P	P	C	N	
Cheeseweed	C	P	C	C	P	P	P	C	P	P	P	C	N	N	C	N	C	P	N	C	C	N	
Chickweeds	C	P	C	C	C	P	C	P	C	C	C	C	C	N	C	N	C	C	C	C	N	N	
Clovers	P	P	--	P	P	N	N	P	N	N	C	-	N	N	P	N	P	P	N	P	N	N	
Cockleburs	P	C	--	-	P	C	N	P	N	N	C	-	N	N	C	N	P	C	P	C	C	N	
Cudweeds	C	C	--	C	C	C	N	N	N	N	C	C	N	N	C	N	P	C	N	C	C	N	
Fiddlenecks	C	C	--	C	C	P	C	C	C	C	C	C	C	N	C	N	P	C	N	C	C	N	
Filarees	P	C	C	C	C	P	P	C	N	N	C	C	P	N	C	N	C	P	N	P	C	N	
Goosefoot, nettleleaf	C	C	C	C	C	P	C	C	C	C	C	C	C	N	C	N	P	C	N	C	C	N	
Groundcherries	C	C	C	C	N	C	N	C	N	C	C	P	P	N	C	N	C	C	P	C	C	N	
Groundsel, common	C	N	C	C	P	P	N	C	N	N	P	C	N	N	C	N	P	C	N	C	C	N	
Hairy fleabane	P	P	P	C	N	P	N	P	N	N	C	P	N	N	P	N	C	C	N	P	P	N	
Henbit	C	C	C	C	N	P	C	C	C	C	C	P	P	N	C	N	C	P	C	C	C	N	
Horseweed	P	P	C	C	N	P	N	P	N	N	C	P	N	N	C	N	C	C	N	P	P	N	
Knotweed, common	C	C	--	C	C	P	C	P	C	C	C	C	C	N	P	N	P	P	N	P	N	N	
Lambsquarters	C	C	C	C	C	P	C	C	C	C	C	C	C	N	C	N	P	C	N	P	C	N	
London rocket	C	C	C	C	C	P	N	C	P	C	C	P	N	N	C	N	C	C	N	C	P	N	
Mullein, turkey	N	N	--	C	P	P	N	P	N	N	N	C	P	N	P	N	C	P	N	P	N	N	
Mustards	C	C	C	C	P	P	N	C	P	C	C	P	N	N	C	N	C	C	N	C	P	N	
Nettles	C	C	C	C	P	C	P	C	N	C	C	C	N	N	P	N	C	N	N	C	C	N	
Nightshades	C	C	C	C	N	C	N	C	N	C	C	P	N	N	C	N	C	C	N	C	C	N	
Pigweeds	P	C	C	C	C	P	C	C	C	C	C	C	C	N	C	N	C	C	N	C	C	N	
Prickly lettuce	C	C	P	C	C	P	N	C	N	N	C	C	N	N	C	N	C	C	N	P	P	N	
Primrose, evening	-	P	--	C	P	N	P	P	P	P	C	C	P	N	C	N	C	C	N	C	P	N	
Puncturevine	C	P	C	C	P	C	P	P	P	N	P	P	P	N	C	N	P	C	P	C	P	N	
Purslanes	C	C	C	C	C	C	C	C	C	C	C	C	C	N	C	N	C	C	N	C	P	N	
Russian thistle	C	P	C	C	P	C	P	P	P	P	C	P	P	N	P	N	C	C	N	P	N	N	
Shepherd's-purse	C	C	C	C	P	P	N	C	P	C	C	C	N	N	C	N	C	C	N	C	C	N	
Sowthistles	C	C	P	C	C	P	N	C	N	N	C	C	N	N	C	N	C	C	N	C	C	N	
Spotted spurge	C	N	C	C	C	C	P	C	P	P	P	P	P	N	C	N	C	C	N	C	N	N	
Wild radish	C	C	C	C	P	P	N	C	N	C	C	C	N	N	C	N	C	C	N	C	P	N	
Willowherb, panicle	-	N	C	P	N	P	P	C	-	-	N	-	-	N	P	N	C	P	-	N	N	N	

NB = Non-bearing vineyards

CLET = clethodim (Prism)
DICH = dichlobenil (Casoron)
DIQU = diquat (Reglone)
DIUR = diuron (Karmex/Direx)
FLUA = fluazifop (Fusilade)
FLUM = flumioxazin (Chateau)
ISOX = isoxaben (Gallery T&V)
MSMA = msma (MSMA)
NAPR = napropamide (Devrinol)
NORF = norflurazon (Solicam)
ORYZ = oryzalin (Surflan)
OXYF = oxyfluorfen (Goal)
PRON = pronamide (Kerb)
SETH = Sethoxydim (Poast)
SIMA = simazine (Princep)
THIA = thiazopyr (Visor)
TRIF = trifluralin (Treflan)
2,4-D = (various trade names)

GLUF = glufosinate (Rely)
GLYP = glyphosate (Roundup, Touchdown)
PARA = paraquat (Gramoxone)
PEND = pendimethalin (Prowl)

This is not an endorsement for of any trade names listed, nor does the omission of specific trade names reflect the view of the author. Please refer to your local dealer or chemical representative for specific herbicide products available.

This chart is not intended to be a recommendation for the use of herbicides. Refer to the appropriate label for application recommendations. Proper weed identification, timing, and accurate application are imperative for effective control. The information in this chart is tentative and may change as warranted. Always follow the label carefully when using herbicides. Kurt J. Hembree, Farm Advisor, Fresno County. Feb. 2005.

Chart 2. Susceptibility of Annual Grass and Perennial Weeds to Herbicides Registered in Grapes in California

	Preemergence													Postemergence									
C = Control P = Partial control N = No control -- = No information	**DICH**	**DIUR**	**FLUM**	**ISOX - NB**	**NAPR**	**NORF**	**ORYZ**	**OXYF**	**PEND - NB**	**PRON**	**SIMA**	**THIA - NB**	**TRIF**	**CLET - NB**	**DIQU - NB**	**FLUA - NB**	**GLUF**	**GLYP**	**MSMA - NB**	**PARA**	**OXYF**	**SETH**	**2,4-D**
Annual Grasses																							
Annual bluegrass	C	C	C	N	C	C	C	P	C	C	C	C	C	C	P	N	C	C	N	N	C	N	N
Barnyardgrass	P	C	C	N	C	P	C	P	C	C	P	C	C	C	P	C	C	C	P	P	P	C	N
Bromegrasses	C	C	P	N	C	C	C	P	C	C	-	C	C	P	-	P	C	C	-	N	C	P	N
Canarygrass	C	C	P	N	C	C	C	P	C	C	P	C	C	C	P	C	C	C	N	N	C	C	N
Crabgrass, large	P	C	C	N	C	P	C	N	C	C	N	C	C	C	C	C	C	C	C	N	C	C	N
Fescues	-	C	P	N	C	C	C	N	C	C	P	P	C	P	C	P	P	C	-	N	C	P	N
Foxtails	-	C	C	N	C	P	C	N	C	C	C	C	C	C	P	C	C	C	-	N	P	C	N
Junglerice	P	C	C	N	C	P	C	P	C	C	P	C	C	C	P	C	C	C	P	P	P	C	N
Lovegrass	P	C	C	N	C	P	C	C	C	C	P	P	C	C	P	C	C	C	-	N	C	C	N
Ryegrass, Italian	-	C	P	N	C	C	C	N	C	C	P	C	C	C	P	C	C	C	N	N	C	C	N
Sandbur	C	C	C	N	C	C	C	N	C	P	C	C	C	C	P	C	C	C	C	N	P	C	N
Sprangletops	-	P	P	N	C	P	P	N	P	C	N	C	C	C	N	C	C	C	N	P	P	C	N
Wild barley	C	C	P	N	C	C	C	P	C	C	P	C	C	C	P	C	C	C	N	N	C	C	N
Wild oat	C	P	C	N	C	C	P	P	P	C	C	P	P	P	P	C	C	C	N	N	C	C	N
Witchgrass	P	C	P	N	C	P	C	P	C	C	P	P	C	C	P	P	P	C	N	N	C	P	N
Perennials (seedling)																							
Bermudagrass	P	C	N	N	C	C	C	P	C	C	P	C	C	C	P	C	C	C	N	N	C	C	N
Dallisgrass	C	C	--	N	C	C	C	P	C	C	C	C	C	C	P	C	C	C	C	N	C	C	N
Johnsongrass	N	C	C	N	C	C	C	P	C	C	C	C	C	C	P	C	C	C	C	N	C	C	N
Field bindweed	C	P	--	C	N	P	P	P	P	N	P	P	P	N	P	N	C	C	N	N	C	N	P
Perennials (established)																							
Bermudagrass	P	N	N	N	N	P	N	P	N	N	N	N	N	C	N	C	P	C	N	N	N	C	N
Dallisgrass	N	N	N	N	N	P	N	P	N	N	N	N	N	C	N	C	P	C	C	N	N	C	N
Johnsongrass	N	N	N	N	N	C	N	P	P	N	N	P	P	C	N	C	P	C	N	N	N	C	N
Field bindweed	P	N	N	N	N	N	N	N	P	N	N	P	P	N	P	N	P	P	N	N	P	N	N
Nutsedge, purple	C	N	N	N	N	P	N	N	N	N	N	P	N	N	P	N	P	C	P	N	C	N	N
Nutsedge, yellow	C	N	N	N	N	P	N	N	N	N	N	C	N	N	P	N	P	C	C	N	C	N	N

NB = Non-bearing vineyards

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DICH = dichlobenil (Casoron)
DIQU = diquat (Reglone)
DIUR = diuron (Karmex/Direx)
FLUA = fluazifop (Fusilade)
FLUM = flumioxazin (Chateau)
GLUF = glufosinate (Rely)
GLYP = glyphosate (Roundup, Touchdown)
ISOX = isoxaben (Gallery T&V)
MSMA = msma (MSMA)
NAPR = napropamide (Devrinol)
NORF = norflurazon (Solicam)
ORYZ = oryzalin (Surflan)
OXYF = oxyfluorfen (Goal)
PARA = paraquat (Gramoxone)
PEND = pendimethalin (Prowl)
PRON = pronamide (Kerb)
SETH = Sethoxydim (Poast)
SIMA = simazine (Princep)
THIA = thiazopyr (Visor)
TRIF = trifluralin (Treflan)
2,4-D = (various trade names)

This is not an endorsement for of any trade names listed, nor does the omission of specific trade names reflect the view of the author. Please refer to your local dealer or chemical representative for specific herbicide products available.

This chart is not intended to be a recommendation for the use of herbicides. Refer to the appropriate label for application recommendations. Proper weed identification, timing, and accurate application are imperative for effective control. The information in this chart is tentative and may change as warranted. Always follow the label carefully when using herbicides. Kurt J. Hembree, Farm Advisor, Fresno County. Feb. 2005.

Table 1. Performance of Preemergence Herbicides in Grapes in California

Herbicide	Conditions favoring effective weed control and crop safety
dichlobenil (Casoron)	Used at 4.0-6.0 lb a.i./acre in vineyards at least 3 years old. Incorporated with furrow or basin-flood irrigation. For nutsedge control. Do not use on coarse soils or injury could result.
diuron (Karmex, Direx)	Used at 2.4-3.2 lb a.i./acre in vineyards at least 3 years old. Use lower rates for lighter soils, especially under drip or other low-volume irrigation. Works well under basin-flood irrigation. Refer to agricultural commissioner for permit if in a Ground Water Protection Area (GWPA).
flumioxazin (Chateau)	Used at 0.188-0.38 lb a.i./acre in bearing and non-bearing vineyards. Applied as a directed spray, being careful to avoid contact with young wood or foliage. Rainfall or irrigation of ¼ to ½" required within 21 to 28 days after treatment for activation. Can be tank-mixed with other residual herbicides for broader weed control and contact herbicides for burn-down of weeds already present. Provides about 1 month residual control for each 2 oz/acre product used. Helps provide preemergence control of annual grasses, marestail, hairy fleabane, and other annual broadleaves.
isoxaben (Gallery T&V)	Used at 0.66-1.33 lb a.i./acre in non-bearing vineyards only. Controls broadleaf weeds only, including hairy fleabane and horseweed. Application made after vines have completely settled into the soil. Rainfall or irrigation of at least 0.5" needed within 21 days of treatment. Apply in at least 10 gal water/acre.
napropamide (Devrinol)	Used at 4.0 lb a.i./acre in bearing and non-bearing vineyards. Apply to the soil surface in 20 to 40 gal water/acre. Must be incorporated by rainfall or sprinkler irrigation within 7 days of treatment. Residual control is reduced under frequent, low-volume drip or micro-sprinkler irrigation. It should be combined with post-emergence herbicides if weeds are emerged. Soil surface is clear of leaves and other debris. Residual period is 4 to 10 months.
norflurazon (Solicam)	Used at 1.0-4.0 lb a.i./acre in vineyards at least 1.5 years old. Rate is adjusted to match soil type, with lower rates on coarse soils under low-volume irrigation. Rainfall or irrigation is needed within 28 days of treatment. It can help to reduce low to moderate levels of nutsedge. It has an 18 month plant-back period; follow the label regarding planting restrictions. Refer to agricultural commissioner for permit if in a Ground Water Protection Area (GWPA).
oryzalin (Surflan)	Used at 2.0-6.0 lb a.i./acre in bearing and non-bearing vineyards. Apply to soil free of leaves and other debris in 20 to 60 gal water/acre. Rainfall or irrigation of 1/4 to 2" needed within 21 days of treatment. It is often combined with oxyfluorfen for broad-spectrum weed control. A post-emergence herbicide should be added if weeds are emerged. Applied at 6 lb a.i. for longer residual control. Chemigation is possible-refer to label. Residual period 4 to 10 months.
oxyfluorfen (Goal)	Used at 1.2-2.0 lb a.i./acre in bearing and non-bearing vineyards. Applied in 20 to 60 gal of water/acre. Rainfall or irrigation of at least 3/4" needed within 21 to 28 days of treatment. Do not disturb the soil following treatment, or poor weed control will result. It is often mixed with oryzalin for broad-spectrum weed control. Refer to the label for use period, cut-off dates, and other restrictions. Residual period 4 to 10 months. Used at 0.5 to 1 lb a.i./acre for burn-down.
pendimethalin (Prowl)	Used at 2.0-4.0 lb a.i./acre in non-bearing vineyards only. Applied in 20 to 40 gal water/acre to soil surface. Rainfall, irrigation, or mechanical incorporation needed within 4 days of treatment. Directed to vines during dormant season, avoiding contact with foliage.
pronamide (Kerb)	Used at 1.0-4.0 lb a.i./acre in bearing and non-bearing vineyards. Rainfall required for incorporation. Controls weeds <2" tall when mixed with a surfactant. Does not control weeds in the sunflower family. Provides short term residual control (6 to 8 weeks).
simazine (Princep)	Used at 2.0-4.0 lb a.i./acre in vineyards more than 3 years old. Rainfall or flood irrigation occurs within 28 days of treatment. Do not use on sandy soils. Mixed with diuron for broader activity. Refer to agricultural commissioner for permit if in a Ground Water Protection Area (GWPA).
thiazopyr (Visor)	Used at 0.5-1.0 lb a.i./acre in non-bearing vineyards only. Applied in 20 to 40 gal water/acre. Applied at 0.5 lb a.i. in the fall and again in the late-winter for nutsedge control. Rainfall is needed within 21 days of treatment. Increased rainfall improves nutsedge control. Tank-mixed with Goal for broader residual control. Residual period is 5 to 8 months.
trifluralin (Treflan)	Used at 0.5-1.0 lb a.i./acre before or after planting and disk incorporated 2 to 4" deep. Useful for eradicating Johnsongrass in combination with a French plow. Granular formulation can be used after planting followed by irrigation or rainfall.

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Numerous factors influence the performance of herbicides. The observations and comments in this table assume proper weed identification and accurate application and timing of treatments. Consult Charts 1 and 2 and the proper herbicide labels for the effectiveness of the registered herbicides to control your specific weeds. This table is not intended to be a recommendation for the use of herbicides. Always follow the label carefully when using herbicides. Kurt J. Hembree, Farm Advisor, Fresno County. Feb. 2005.

Table 2. Performance of Postemergence Herbicides in Grapes in California

Herbicide	Conditions favoring effective weed control and crop safety
clethodim (Prism)	Used at 0.09-0.25 lb a.i./acre in non-bearing vineyards only. A crop oil concentrate (1% v/v) or a non-ionic surfactant (0.25% v/v) is added. Applied in 20 to 40 gal water/acre with thorough weed coverage. Gives selective control of annual grasses (except bromes and fescues) that are actively growing, before tillering, and not stressed. Repeat applications are required on perennials when their growth is according to label.
diquat dibromide (Reglone)	Used at 0.375-0.5 lb a.i./acre in non-bearing vineyards only. A non-ionic surfactant is added at 0.25% v/v. Applied in 20 to 60 gal water/acre with thorough weed coverage. Weeds are less than 4" tall. Control is improved during warm, dry weather.
fluazifop-p-butyl (Fusilade)	Used at 0.25-0.375 lb a.i./acre in non-bearing vineyards only. A crop oil concentrate (1% v/v) or a non-ionic surfactant (0.25% v/v) is added. Applied in 20 to 40 gal water/acre with thorough weed coverage. Gives selective control of annual grasses (except annual bluegrass, bromes, or fescues) that are actively growing, before tillering, and not stressed. Repeat treatments are required on perennials when their growth is according to label.
glufosinate (Rely)	Used at 0.75-1.5 lb a.i./acre in bearing and non-bearing vineyards. It has contact activity and no translocation. Use in 30 to 50 gal water/acre with good weed coverage. Ammonium sulfate should be added at 5 lb/100 gal water/acre. Hollow cone nozzles can improve control. Weeds are less than 6" tall. Controls tough weeds like hairy fleabane, horseweed, nettle, cheeseweed, filaree, and many others. It can be mixed with pre-emergence herbicides. Avoid drift onto green bark or leaves or injury could result.
glyphosate (Roundup, Touchdown)	Used at 0.5-4.0 lb a.i./acre in bearing and non-bearing vineyards. Applied by ground with low-pressure, flat fan nozzles, a controlled droplet applicator, or a smart sprayer system. Adding ammonium sulfate at 5 to 10 lb/100 gal water may improve control. For annual weeds, use 1.0 lb a.i. in 3 to 40 gal water/acre. Apply to young, actively growing annual weeds or perennials when they are flowering. Some perennials may require highest label rate. Avoid drift onto green wood or foliage of vines or injury will result. Weeds should not be cultivated for 7 to 14 days after treatment to maximize control. Can be combined with low rates of oxyfluorfen for broader weed control, as well as combined with pre-emergence herbicides.
msma (MSMA)	Used at 2.0 lb a.i./acre in non-bearing vineyards that are at least 1 year old. Applied on yellow nutsedge in 60 gal water/acre. Multiple applications may be needed. Air temperature is around 85ºF for best activity.
oxyfluorfen (Goal)	Used at 0.5-1.0 lb a.i./acre in bearing and non-bearing vines. Applied during dormant period or following bloom (raisins and wine grapes) to weeds at the 4-leaf stage or sooner. Combined with glyphosate or other post-emergence herbicides to control specific weeds.
paraquat (Gramoxone)	Used at 0.6-0.9 lb a.i./acre in bearing and non-bearing vineyards. A non-ionic surfactant is added at 0.5% v/v. Applied in 20 to 60 gal water/acre with thorough weed coverage. Weeds are less than 4" tall. Repeat applications needed as new growth occurs. It is a Restricted Use Pesticide, requiring a permit from the county agricultural commissioner for purchase and use.
sethoxydim (Poast)	Used at 0.28-0.47 lb a.i./acre in non-bearing vineyards only. A crop oil concentrate is added at 1% v/v. Applied in 20 to 40 gal water/acre with thorough weed coverage. Gives selective control of annual grasses (except annual bluegrass, bromes, or fescues) that are actively growing, before tillering, and not stressed. Repeat treatments are required on perennials when their growth is according to label.
2,4-D amine (Weedaxe)	Used at 1.0-1.4 lb a.i./acre in vineyards at least 3 years old. Selective on small, vigorous broadleaf weeds. Do not use on sandy soils, when windy, when trees or vines are in bloom, or under hot conditions can result in injury. Do not make application before an irrigation or rainfall or injury could result. Sprayer is cleaned after application according to label.

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