

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

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

NB = Non-bearing vineyards

CLET = clethodim (Prism)
DICH = dichobenzil (Casoron)
DIQU = diquat (Reglone)
DIUR = diuron (Karmex)
EPTC = eptc (Eptam)
FLUA = fluazifop (Fusilade)

GLYP = glyphosate (Roundup, Touchdown)
HALO = halosulfuron (Sempra CA)
ISOX = isoxaben (Gallery T&V)
MSMA = msma (MSMA)
NAPR = napropamide (Devrinol)
NORF = norflurazon (Solicam)

PARA = paraquat (Gramoxone)
PEND = pendimethalin (Prowl)
SETH = Sethoxydim (Poast)
SIMA = simazine (Princep)
THIA = thiazopyr (Visor)
TRIF = trifluralin (Treflan)

FLUM = flumioxazin (Chateau)
GLUF = glufosinate (Rely)

ORYZ = oryzalin (Surflan)
OXYF = oxyfluorfen (Goal)

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.

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

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

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Table 1. Performance of Preemergence Herbicides in Walnuts in California

Herbicide	Conditions favoring effective weed control and crop safety
dichlobenil (Casoron)	Used at 4.0-6.0 lb a.i./acre in orchards at least 3 years old. Incorporated with furrow or basin-flood irrigation. Do not use on coarse soils or injury could result.
diuron (Karmex, Direx)	Used at 2.4-3.2 lb a.i./acre in orchards at least 1 year 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).
eptc (Eptam)	Used at 2.1-3.0 lb a.i./acre in bearing and non-bearing orchards. Applied in flood irrigation water following final ground preparation at least 17 days before harvest. The soil is level, allowing for uniform application across and down field without ponding. Short-term residual control (4 to 6 weeks).
flumioxazin (Chateau)	Used at 0.188-0.38 lb a.i./acre in bearing and non-bearing orchards. 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 burndown of weeds already present. Provides about 1 month residual control for each 2 oz/acre product used. Helps provide preemergence control of annual grasses, marehail, hairy fleabane, and other annual broadleaves.
isoxaben (Gallery T&V)	Used at 0.66-1.33 lb a.i./acre in non-bearing orchards only. Application made after trees have completely settled into the soil. Rainfall or irrigation of at least 1/2” 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 orchards. 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 orchards 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 orchards. Apply to soil free of leaves and other debris in 20 to 60 gal water/acre. Rainfall or irrigation of ¼ 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 is 4 to 10 months.
oxyfluorfen (Goal)	Used at 1.2-2.0 lb a.i./acre in bearing and non-bearing orchards. Applied in 20 to 60 gal water/acre. Rainfall or irrigation of at least ¾” needed within 21 to 28 days of treatment. Do not disturb the soil following treatment, or poor weed control will result. It is often combined 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 0.5-1 lb a.i./acre for burn down.
pendimethalin (Prowl)	Used at 2.0-4.0 lb a.i./acre in non-bearing orchards 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 trees during dormant season, avoiding contact with foliage.
simazine (Caliber)	Used at 1.0-2.0 lb a.i./acre in orchards at least 3 years old. Rainfall or flood irrigation occurs within 28 days of treatment. Do not use on sandy soils. Adjust rate to soil type. 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 orchards 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 helping to eradicate Johnsongrass prior to planting. Granular formulation can be used after planting and incorporated immediately after planting.

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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 Walnuts 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 orchards only. A crop oil concentrate or a non-ionic surfactant 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 orchards 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.
fluzifop-p-butyl (Fusilade)	Used at 0.25-0.375 lb a.i./acre in non-bearing orchards 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 orchards. It is a contact herbicide. Use in 30 to 50 gal water/acre with good 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. Can be mixed with pre-emergence herbicides. Avoid drift onto green bark or leaves.
glyphosate (Roundup, Touchdown)	Used at 0.5-4.0 lb a.i./acre in bearing and non-bearing orchards. Applied by ground with low-pressure, flat fan nozzles, controlled droplet applicator, or smart sprayer. Add AMS at 5 to 10 lb/100 gal water to improve control. For annual weeds, use 1.0 lb a.i. in 3 to 40 gal water/acre. Apply to young, growing annuals or perennials when they are flowering. Some perennials require highest label rate. Avoid drift onto green wood or foliage of trees. Weeds should not be cultivated for 7 to 14 days after treatment. Can be combined with low rates of oxyfluorfen for broader weed control, as well as combined with pre-emergence herbicides.
halosulfuron (Sempra CA)	Used at 0.032-0.063 lb a.i./acre in bearing and non-bearing orchards. A non-ionic surfactant is added at 0.25% v/v. Trees completely settled in soil before treatment. Avoid contact with tree foliage and roots, especially in soils that crack, or injury could result. Use where nutsedge has fewer than 5 leaves. Applied by ground with low-pressure, flat fan nozzles. Do not use a controlled droplet applicator. Sprayer is cleaned after application according to label.
msma (MSMA)	Used at 2.0 lb a.i./acre in non-bearing orchards at least 1 year old. Applied on yellow nutsedge in 60 gal water/acre. Multiple applications may be needed. Air temperature is around 85°F for best activity.
oxyfluorfen (Goal)	Used at 0.5-1.0 lb a.i./acre in bearing and non-bearing orchards. Applied during dormant period or following bloom (according to label directions) 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 0.3-0.9 lb a.i./acre in bearing and non-bearing orchards. 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. A restricted herbicide, 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 bearing and non-bearing orchards. 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 orchards at least 1 year 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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