Centaurea melitensis L.

Malta starthistle or tocalote

Family: Asteraceae
Range: All southwestern states, including California, Nevada, Utah, Arizona, New Mexico and Texas, as well as Oregon and Washington.
Habitat: Open disturbed sites, open hillsides, grassland, rangeland, open woodlands, fields, pastures, roadsides, waste places. May also inhabit cultivated fields.
Origin: Native to southern Europe. Malta starthistle is thought to have been introduced into California in the late 1700s during the Spanish Missionary period.
Impacts: Not as competitive or widespread as yellow starthistle. May increase erosion and reduce water percolation, but does not survive as long as yellow starthistle so it is not likely to have the same effect on soil moisture depletion. Dense stands can displace native plants and animals, with documented negative effects on seed production in the endangered mint *Acanthiminta ilicifolia*. Malta starthistle is not known to cause chewing disease in horses and is used medicinally in Spain.
Western states listed as Noxious Weed: California, Nevada, New Mexico
California Invasive Plant Council (Cal-IPC) Inventory: Moderate Invasiveness

Malta starthistle is a simple to bushy winter annual with spiny yellow-flowered heads. Although it can resemble yellow starthistle, it is typically much shorter, growing to a maximum of 3 ft tall. In addition, Malta starthistle completes its life cycle earlier than yellow starthistle, and generally does not survive late into summer. Plants exist as basal rosettes through winter and early spring until flower stems develop in late spring. Its foliage is grayish- to bluish-green, with fine white cottony hairs. Its leaf bases form wings along the stems.

The flowerheads of Malta starthistle are solitary or in close clusters of two to three. Like yellow starthistle, the phyllaries are often sparsely covered with cobwebby hairs. The central spine of main phyllaries is half the length (5 to 12 mm long) of yellow starthistle and is generally purple- to brown-tinged. Malta starthistle produces three different types of flowerheads, including fully expanded flowers capable of cross-pollination, and two cleistogamous (self-pollinated) types, one with yellow flowers only partially protruding and the other without exerted flowers.

Malta starthistle reproduces only by seed. Malta starthistle only has one type of achene, while yellow starthistle has two. The achenes of Malta starthistle are all finely pubescent, grayish to tan, with a bristly pappus, 1 to 3 mm long. Unlike yellow starthistle, the senesced heads retain the central spines and often shed the loose receptacle and dense fuzzy gray hairs, leaving a shallow bowl of spiny phyllaries. The vast majority of seeds fall near the parent plant. Most seeds germinate after the first fall rains. Seed longevity in the soil is probably similar to yellow starthistle: few seeds survive beyond 4 years, but seeds can survive for up to about 10 years under certain conditions.

NON-CHEMICAL CONTROL

Mechanical (pulling, cutting, disking)	Removal techniques such as hand pulling, mowing, or cultivation, when used to prevent seed production over 2 to 4 years or more (the soil life of the seeds), should reduce or eliminate an infestation. See control techniques for yellow starthistle. These same techniques are expected to be effective on Malta starthistle.
Cultural	There have been no studies conducted on the use of grazing or prescribed burning for the control of Malta starthistle. It is possible that control with grazing would be similar to that of yellow starthistle. However, it

	is very unlikely that prescribed burning would be an effective tool, as the timing of the life cycle of Malta starthistle is much earlier than yellow starthistle and burning could possibly damage many desirable species. In addition, Malta starthistle does not typically occur in dense enough infestations to provide enough fuel to carry a fire.
Biological	A small seedhead-feeding beetle (*Lasioderma haemorrhoidale*) was unintentionally introduced to California from the Mediterranean region, but has had little effect in controlling Malta starthistle. It is considered a generalist seedhead feeder and is also known to attack yellow starthistle, Sicilian starthistle, blessed milkthistle and Italian thistle. The false peacock fly and hairy weevil, introduced to control yellow starthistle, will also attack Malta starthistle, but to a lesser degree than yellow starthistle.

CHEMICAL CONTROL

The following specific use information is based on reports by researchers and land managers and much of the information is from research with *Centaurea solstitialis* (yellow starthistle). Little research has been conducted on the control of Malta starthistle. Other trade names may be available, and other compounds also are labeled for this weed. Directions for use may vary between brands; see label before use. Herbicides are listed by mode of action and then alphabetically. The order of herbicide listing is not reflective of the order of efficacy or preference.

GROWTH REGULATORS	
2,4-D Several names	**Rate:** 1 to 1.5 pt product/acre (0.48 to 0.72 lb a.e./acre) for small rosettes, 2 to 4 pt product/acre (0.95 to 1.9 lb a.e./acre) for larger plants up to bolting **Timing:** Postemergence from rosette to beginning of bolting, but before flowering. **Remarks:** 2,4-D controls larger plants well, but is not considered as effective as other growth regulator herbicides for season-long control. It is broadleaf-selective and has no soil activity. Do not apply ester formulation when outside temperatures exceed 80°F. Amine forms are as effective as ester forms for small rosettes, and amine forms reduce the chance of off-target movement.
Aminocyclopyrachlor + chlorsulfuron *Perspective*	**Rate:** 3 to 5 oz product (*Perspective*)/acre **Timing:** Postemergence and preemergence. Postemergence applications are most effective when applied to plants from the seedling to the mid-rosette stage. **Remarks:** Aminocyclopyrachlor gives control of yellow starthistle similar to aminopyralid. *Perspective* provides broad-spectrum control of many broadleaf species. Although generally safe to grasses, it may suppress or injure certain annual and perennial grass species. Do not treat in the root zone of desirable trees and shrubs. Do not apply more than 11 oz product/acre per year. At this high rate, cool-season grasses will be damaged, including bluebunch wheatgrass. Not yet labeled for grazing lands. Add an adjuvant to the spray solution. This product is not approved for use in California and some counties of Colorado (San Luis Valley).
Aminopyralid *Milestone*	**Rate:** 4 to 5 oz product/acre (1 to 1.25 oz a.e./acre). Use higher rates when weeds are larger. **Timing:** Postemergence and preemergence. Postemergence applications are most effective when applied to plants from the seedling to the mid-rosette stage. **Remarks:** Aminopyralid is one of the most effective herbicides for the control of all starthistles. It is safe on grasses, although preemergence application at high rates can greatly suppress invasive annual grasses, such as medusahead. Aminopyralid has a longer residual and higher activity than clopyralid. Other members of the Asteraceae and Fabaceae are very sensitive to aminopyralid. For postemergence applications, a non-ionic surfactant (0.25 to 0.5% v/v spray solution) enhances control under adverse environmental conditions; however, this is not normally necessary. Other premix formulations of aminopyralid can also be used for Malta starthistle control. These include *Chaparral* (aminopyralid + metsulfuron; 1.5 to 2 oz product/acre), *Opensight* (aminopyralid + metsulfuron; 1.5 to 2 oz product/acre), and *Forefront HL* (aminopyralid + 2,4-D; 1.5 to 2.1 pt product/acre), all applied at the rosette to bolting stages.
Clopyralid *Transline*	**Rate:** 0.25 to 0.67 pt product/acre (1.5 to 4 oz a.e./acre). Seedlings and rosettes can be treated at the lower rate, but bolted plants should be treated at higher rates. **Timing:** Postemergence and preemergence. For postemergence application, apply to plants from seedling to mid-bolting stage. However, optimal timing is at the later rosette stages, but before bolting. **Remarks:** Clopyralid gives excellent control of all starthistles. While it is very safe on grasses, it will injure many members of the Asteraceae, particularly thistles, and can also injure legumes, including clovers. Most other broadleaf species and all grasses are not injured. When clopyralid is used to control seedlings, a surfactant is not necessary. However, when treating older plants or plants

	exposed to moderate levels of drought stress, surfactants can enhance the activity of the herbicide.
Dicamba *Banvel*, *Clarity*	**Rate:** 0.5 pt product/acre (0.25 lb a.e./acre) for seedlings, 1 to 1.5 pt product/acre (0.5 to 0.75 lb a.e./acre) for larger plants up to bolting. **Timing:** Postemergence to plants from rosette to beginning of bolting. **Remarks:** Dicamba is a broadleaf-selective herbicide often combined with other active ingredients. It is not typically used alone to control any starthistle species.
Picloram *Tordon 22K*	**Rate:** 1 to 2 pt product/acre (4 to 8 oz a.e./acre) **Timing:** Postemergence and preemergence. Postemergence applications should be made to plants from rosette to bud formation stage. Apply when there is adequate soil moisture and weeds are growing rapidly. **Remarks:** Picloram acts much like aminopyralid, aminocyclopyrachlor, and clopyralid, but gives a broader spectrum of control and has much longer soil residual activity. It can provide about 2 to 3 years of control. Most broadleaf plants are susceptible. Although well-developed grasses are not usually injured by labeled use rates, some applicators have noted that young grass seedlings with fewer than four leaves may be killed. Do not apply near trees. *Tordon 22K* is a federally restricted use pesticide. Picloram is not registered for use in California.
Triclopyr *Garlon 3A*, *Garlon 4 Ultra*	**Rate:** 1 pt *Garlon 4 Ultra* or 1.33 pt *Garlon 3A*/acre (0.5 lb a.e./acre) for seedlings, up to 3 pt *Garlon 4 Ultra* or 4 pt *Garlon 3A*/acre (1.5 lb a.e./acre) for larger plants. **Timing:** Postemergence from seedling to bolting stage. **Remarks:** Triclopyr has little to no residual activity. It is broadleaf-selective and typically does not harm grasses. Formulated as both an amine and ester. *Garlon 4 Ultra* is formulated as a low volatile ester. However, in warm temperatures, spraying onto hard surfaces such as rocks or pavement can increase the risk of volatilization and off-target damage.
AROMATIC AMINO ACID INHIBITORS	
Glyphosate *Roundup*, *Accord XRT II*, and others	**Rate:** Broadcast foliar treatment: 1.33 to 2.67 qt product (*Roundup ProMax*)/acre (1.5 to 3 lb a.e./acre). Spot treatment: 1% to 2% v/v solution **Timing:** Postemergence from bolting to beginning of flowering. **Remarks:** Glyphosate is the most effective herbicide for late season control. Good coverage, clean water, and rapidly growing Malta starthistle plants are all essential for adequate control. It has no soil activity. Glyphosate is nonselective. To achieve selectivity, it can be applied using a wiper or spot treatment to control current year's plants. In late season treatments a surfactant should be added to the herbicide mixture.
BRANCHED-CHAIN AMINO ACID INHIBITORS	
Chlorsulfuron *Telar*	**Rate:** 1.33 to 2.6 oz product/acre (1 to 1.95 oz a.i./acre) **Timing:** Preemergence activity only. Chlorsulfuron does not have postemergence activity on yellow or Malta starthistle and must be used in combination with 2,4-D, dicamba, or triclopyr to provide effective control. **Remarks:** Chlorsulfuron has mixed selectivity on both broadleaf and grass species but is generally safe on grasses. It has a fairly long soil residual. The herbicide solution requires constant agitation during application.
Imazapyr *Arsenal*, *Habitat*, *Stalker*, *Chopper*, *Polaris*	Not often used for Malta starthistle control but has been shown to be somewhat effective at 3 to 4 pt product/acre. It has preemergence and some postemergence activity, and has a long soil residual.
Sulfometuron *Oust* and others	Not often used for Malta starthistle control but has been shown to be somewhat effective at 1 to 2 oz product/acre. It has preemergence activity only, and a long soil residual.
PHOTOSYNTHETIC INHIBITORS	
Hexazinone *Velpar L*	Not often used for Malta starthistle control but has been shown to be somewhat effective at 1 to 2.5 gal product/acre (2 to 5 lb a.i./acre). It has preemergence activity only, and a long soil residual. High rates of hexazinone can create bare ground, so only use high rates in spot treatments.

RECOMMENDED CITATION: DiTomaso, J.M., G.B. Kyser et al. 2013. *Weed Control in Natural Areas in the Western United States*. Weed Research and Information Center, University of California. 544 pp.