Sisymbrium altissimum L.; tumble mustard
Sisymbrium irio L.; London rocket

Tumble mustard and London rocket

Family: Brassicaceae
Range: London rocket is found primarily in the southwestern United States, including California, Nevada, Arizona, Utah, Colorado, and New Mexico. Tumble mustard is found in every contiguous state, including all western states.
Habitat: Both species are found in disturbed areas such as abandoned fields, roadsides, orchards. They are also found in deserts and riparian areas.
Origin: Still unclear but thought to have originated in Europe and Eurasia.
Impact: Both species mature earlier in the year than native species, giving them a competitive advantage. They are widespread in cultivated agricultural fields within their ranges. They can replace native annuals in wildland settings. Like other mustards, London rocket can harbor diseases and pests that attack closely related crops in the mustard family.
California Invasive Plant Council (Cal-IPC) Inventory: *S. irio*, Moderate Invasiveness

London rocket is an erect annual or winter annual forb that grows up to 2 to 3 ft tall, more commonly to around 20 inches. Its stems are glabrous or slightly pubescent and have several branches near the base of the plant. They are green and sometimes have a purple tinge. The basal leaves are about 6 inches long with a pronounced midvein. They are deeply lobed, ovate to lanceolate, and alternately positioned along the stem. Leaves along the upper stem are smaller and are narrow or oblong in shape.

Tumble mustard is a winter or summer annual, or even sometimes a biennial, to 4.5 ft tall, with ascending linear pods. Its foliage is sparsely long-hairy and the lower leaves can be 6 inches long, with a triangular shaped terminal lobe and lanceolate lateral lobes. The upper leaves are dissected into long linear lobes.

The inflorescences are terminal racemes. The flowers are bright to pale yellow with four petals. The petals of London rocket are 2.5 to 4 mm long and those of tumble mustard are twice as long. The seed pods grow in an ascending pattern on the upper stem and are linear and cylindrical. The seed pods of London rocket are 1.25 to 1.5 inches long and those of tumble mustard are 2 to 4 inches long. Both species reproduce only by seed and are capable of producing several thousand seeds per plant. The seeds of London rocket disperse when the fruit split and drop the seed to the soil beneath the parent plant. The seeds of tumble mustard disperse when senesced stems break off at ground level and tumble with the wind. Buried seeds of both species survive up to about 10 years.

NON-CHEMICAL CONTROL

Mechanical (pulling, cutting, disking)	Hand pulling is a viable control method if the population is small and isolated. However, it is time-consuming and difficult to use when managing widespread infestations. For smaller plants in the early rosette stage, a hula hoe can be effective. Mowing can reduce populations provided it is done before the seeds become viable to eventually exhaust

	the seedbank. Cultivation is very effective when done before seed production. Solarization has been shown to be an effective method of killing London rocket plants and seeds in areas with hot summers.
Cultural	Grazing is effective if timed to prevent seed production. Grazing with sheep is preferred over cattle because they graze lower on the plant. Additionally, meat and milk can become tainted when cows consume large quantities of these mustards. Burning is effective when done before seed production, provided there is sufficient fuel to carry a fire. Seed on the soil surface can potentially be killed by the heat from the fire; however, research in Australia showed that burning standing wheat stubble does not achieve a temperature high enough to kill mustard seeds. Temperatures did reach high enough levels to kill seeds when crop residue was concentrated in windrows. Burning is not usually recommended because the fuel needed to carry a fire would likely be after seed production was completed.
Biological	No microbial pathogens or insect biocontrol agents are available for the control of either *Sisymbrium* species.

CHEMICAL CONTROL

The following specific use information is based on published papers and reports by researchers and land managers. 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 2 qt product/acre (0.95 to 1.9 lb a.e./acre) **Timing:** Postemergence, to rapidly growing plants. Most effective on smaller plants. **Remarks:** 2,4-D is broadleaf-selective. Effective control may require repeat applications. It has no soil activity. Use a surfactant. Do not apply ester formulations when outside temperatures exceed 80°F. It is heavily restricted in grape-growing areas. 2,4-D can be mixed with various other compounds (e.g., dicamba, triclopyr, carfentrazone), either in tank mixes or in commercial combinations.
Aminocyclopyrachlor + chlorsulfuron *Perspective*	**Rate:** 1.75 to 2.75 oz product/acre **Timing:** Postemergence in spring up to flowering. **Remarks:** Provides broad-spectrum control of many broadleaf species. Generally safe for grasses, but 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 + metsulfuron *Opensight*	**Rate:** 1.5 to 2 oz product/acre **Timing:** Preemergence in fall or postemergence when target plants are in the seedling to rosette stage. **Remarks:** Not registered for use in California.
Dicamba *Banvel*, *Clarity*	**Rate:** 1 to 2 pt product/acre (0.5 to 1 lb a.e./acre) **Timing:** Postemergence, to rapidly growing plants. Most effective on smaller plants. **Remarks:** Dicamba is a broadleaf-selective herbicide often combined with other active ingredients. It is effective earlier in the season than 2,4-D. It can be tank-mixed with 2,4-D. Has very limited soil residual. Avoid drift to sensitive crops. Do not apply when outside temperatures exceed 80°F. *Overdrive,* a premix of dicamba with diflufenzopyr, has been reported to be effective on some mustard species. Diflufenzopyr is an auxin transport inhibitor which causes dicamba to accumulate in shoot and root meristems, increasing its activity. *Overdrive* is applied postemergence at 4 to 8 oz product/acre to rapidly growing plants. Higher rates should be used on large annuals. Add a non-ionic surfactant to the treatment solution at 0.25% v/v or a methylated seed oil at 1% v/v solution.

Triclopyr + 2,4-D *Crossbow*	**Rate:** 1 qt product/acre **Timing:** Postemergence, to small, rapidly growing weeds. **Remarks:** Both herbicides are active on only broadleaf species. Include non-ionic surfactant.
AROMATIC AMINO ACID INHIBITORS	
Glyphosate *Roundup*, *Accord XRT II*, and others	**Rate:** 1 to 2 pt product (*Roundup ProMax*)/acre (0.56 to 1.1 lb a.e./acre) **Timing:** Postemergence, to rapidly growing plants from rosette to bud stage. **Remarks:** Glyphosate has no soil activity and is nonselective. Its effectiveness is increased by addition of ammonium sulfate.
BRANCHED-CHAIN AMINO ACID INHIBITORS	
Chlorsulfuron *Telar*	**Rate:** 0.25 to 0.5 oz product/acre (0.19 to 0.375 oz a.i./acre) **Timing:** Preemergence to early postemergence. **Remarks:** Chlorsulfuron has mixed selectivity and is generally safe on grasses. It is most effective preemergence. Use a surfactant for postemergence applications. It has fairly long soil residual activity.
Chlorsulfuron + metsulfuron or sulfometuron *Cimarron X-tra* or *Landmark XP*	**Rate:** 0.5 oz *Cimarron X-tra*/acre; 0.9 oz *Landmark XP*/acre **Timing:** Postemergence, to rapidly growing plants. Most effective on smaller plants. **Remarks:** Mixed selectivity. *Cimarron X-tra* is not registered for use in California.
Imazapic *Plateau*	**Rate:** 4 to 6 oz product/acre (1 to 1.5 oz a.e./acre) **Timing:** Preemergence in fall to postemergence in spring. **Remarks:** Mixed selectivity, tends to favor species in the Asteraceae, as well as some grasses. In postemergence applications, use a methylated seed oil surfactant at 0.25% v/v. Some soil residual activity. Not registered for use in California.
Imazapyr *Arsenal*, *Habitat*, *Stalker*, *Chopper*, *Polaris*	**Rate:** Spot treatment: 1 to 5% v/v solution (*Arsenal*), depending on volume of treatment solution **Timing:** Preemergence in fall to postemergence in spring. **Remarks:** Imazapyr is a broad-spectrum herbicide with long soil residual activity. In postemergence applications, use a methylated seed oil surfactant at 0.25% v/v solution.
Metsulfuron *Escort*	**Rate:** 0.5 to 2 oz product/acre (0.3 to 1.2 oz a.i./acre) **Timing:** Preemergence or postemergence to young, rapidly growing weeds in spring before flowering, or in fall to new rosettes. **Remarks:** Mixed selectivity, generally safe on grasses. Some soil residual activity. Use a surfactant. Can be tank-mixed with 2,4-D and/or dicamba, or with chlorsulfuron. Not registered for use in California.
Propoxycarbazone-sodium *Canter R+P*	**Rate:** 0.9 to 1.2 oz product/acre (0.63 to 0.84 oz a.i./acre) **Timing:** Postemergence, to small, rapidly growing plants. **Remarks:** Broad-spectrum herbicide that will control many species, including both London rocket and tumble mustard. Perennial grass species vary in tolerance. A non-ionic surfactant should be added at 0.25 to 0.5% v/v solution.
Rimsulfuron *Matrix*	**Rate:** 2 to 4 oz product/acre (0.5 to 1 oz a.i./acre) **Timing:** Preemergence in fall to early postemergence in spring. **Remarks:** Controls several annual grasses and broadleaves. Perennial grasses are tolerant to fall applications when established and grown under dryland conditions. Application to rapidly growing or irrigated perennial grasses may result in their injury or death. Provides soil residual control in cool climates but degrades rapidly under warm conditions. Rimsulfuron will not control summer annual weeds when applied in fall or spring. Add a surfactant when applying postemergence.
Sulfosulfuron *Outrider*	**Rate:** 0.75 to 2 oz product/acre (0.56 to 1.5 oz a.i./acre) **Timing:** Early postemergence, winter to early spring, when desirable perennials are dormant. **Remarks:** Mixed selectivity, but fairly safe on native perennial grasses, especially wheatgrasses. To be most effective it may be necessary to add a non-ionic surfactant. Fairly long soil residual activity.

PHOTOSYNTHETIC INHIBITORS	
Hexazinone *Velpar L*	**Rate:** 2 to 4 pt product/acre (0.5 to 1 lb a.i./acre) **Timing:** Preemergence to early postemergence. **Remarks:** Both foliar and soil activity. Its selectivity is mixed. Use higher rates on fine soils or high organic matter soils, or when weeds are under stress. Fairly long soil residual activity. Hardwood trees near application site can be damaged when they absorb this chemical through the roots. 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.