

FIELD BINDWEED

Integrated Pest Management for Home Gardeners and Landscape Professionals

Field bindweed, *Convolvulus arvensis*, (Fig. 1) is a native of Eurasia that first was documented in California in 1884 in San Diego. By the first quarter of the twentieth century, field bindweed was proclaimed the worst weed in California and many other Western states. It most likely arrived in the United States as a contaminant in farm and garden seeds. However, because of its flowers and climbing nature, some seeds were probably planted as ornamentals, as a ground cover, in hanging baskets, or on trellises. Field bindweed has been given many names including perennial morningglory, creeping jenny, bellbine, sheepbine, and cornbind.

IDENTIFICATION

The first two leaves (cotyledons) of a field bindweed seedling are nearly square with a shallow notch at the tip (Fig. 2). Plants that arise from rhizomes (underground stems) lack these seed leaves. The first true leaves are arrowhead shaped and have petioles (leaf stems) that are flattened and grooved on the upper surface (Fig. 3).

Mature field bindweed plants have arrowhead-shaped leaves that can be 1/2 to 2 inches long, depending on environmental conditions. Mature leaves at the base of the stem are larger than the young leaves at the stem terminal. The flowers are trumpet shaped, white to pink, and 1 to 1 1/2 inches wide.

Field bindweed is a prostrate plant unless it climbs on an object for support. It often is found growing on upright plants, such as shrubs or grapevines, with its stems and leaves entwined throughout the plant and the flowers exposed to the light (Fig. 4). Under warm, moist conditions, leaves



Figure 1. Field bindweed.



Figure 2. The first two leaves (cotyledons) of a field bindweed seedling are notched.



Figure 3. Field bindweed seedling.

are larger and vines more robust than under drought conditions.

The root system has both deep vertical roots and shallow horizontal lateral roots (Fig. 5). The vertical roots can reach depths of 20 feet or more. However, 70% of the total mass of the root structure occupies the top 2 feet of soil. Most of the lateral roots are no deeper than 1 foot. Experiments on bindweed have shown that its root and rhizome growth can reach 2 1/2 to 5 tons per acre.



Figure 4. Field bindweed climbing up the stem of a shrub.

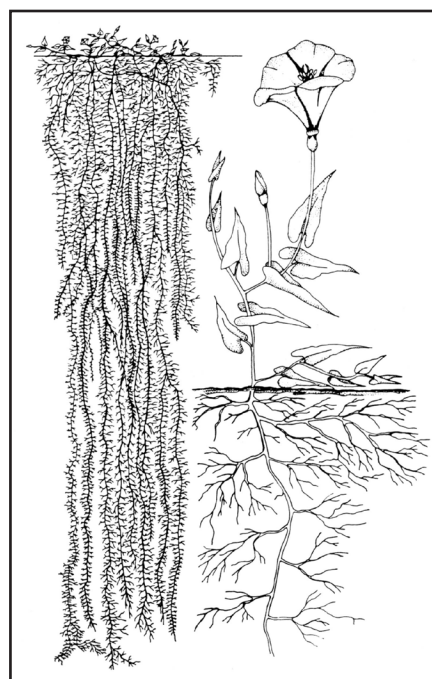


Figure 5. The root system of field bindweed can reach depths of up to 20 feet.

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In contrast to field bindweed, the ornamental annual morningglory (in the genus *Ipomea*) has a larger (2-inch wide) and more showy flower that can be white to blue or purple (Fig. 6); it also has a thicker stem, that is sometimes hairy, and heart-shaped leaves that are 1 1/2 inches wide and 2 inches or more long. The two species are easy to distinguish from each other.

LIFE CYCLE

Field bindweed is a hardy perennial found throughout California below the 5,000-foot elevation line. It spreads from an extensive rootstock and from seed. Most parts of the bindweed roots and rhizomes can produce buds that can create new roots and shoots. Roots capable of budding are found to depths of 14 feet. Fragments of vertical roots and rhizomes as short as 2 inches can form new plants (Fig. 7). Lateral roots serve another important function. About 15 to 30 inches from the parent plant, a lateral often turns downward, becoming a secondary vertical root, and sends out both roots and shoots from the turning point. By this means a single field bindweed plant can spread radially more than 10 feet in a growing season. This extensive underground network allows for overwintering without foliage, and it can persist for many years in the soil.

One to four dark brown seeds (Fig. 8) are produced in round, smooth, 1/4-inch capsules. An average plant produces about 550 seeds. Within one month after forming, the seed coat matures and becomes impervious to water. Seed that is 60 years old has been found to be viable. Once the seed coat is weakened, the seed will germinate at temperatures of 41° to 104°F.

Drought tolerance is a characteristic of field bindweed. In California, it seems to prefer heavy clay soils rather than sandy soils. When water is withheld, bindweed competes better than most other plants. If an area is well watered, some ornamentals might compete better than the bindweed; however, in most cases, bindweed will flourish and twine up plants. In the landscape,

field bindweed will survive with sprinkler or drip irrigation. If there is no summer water, the plant reduces its seed production first and then reduces growth and leaf size, but it still will produce some flowers and seed.

IMPACT

Field bindweed is one of the most persistent and difficult-to-control weeds in landscapes and agricultural crops. It has a vigorous root and rhizome system that makes it almost impossible to control with cultivation between desirable plants or broad scale tillage alone; in fact, it often spreads the infestation. Its seed has a long dormancy and can last in soil for up to 60 years. It has a climbing habit that allows the plant to grow up other plants. In addition rhizomes have the ability to penetrate through fabric, plastic, and other barriers. Field bindweed also is very drought tolerant and once established is difficult to control even with herbicides.

If field bindweed is present, land is devalued and the weed precludes planting of many vegetable crops.

MANAGEMENT

Control of field bindweed isn't easy, and it can't be accomplished with a single treatment or in a single season. Effective control requires prevention of seed production, reduction of stored carbohydrates by deep tillage of the root system, competition for light from other plants, and constant vigilance in removing top growth. Application of herbicides, which reduce bindweed growth and kill germinating seedlings, can also be part of an integrated pest management program.

Prevention

Three practices can reduce the possibility of introducing field bindweed—purchase and plant clean seed and ornamental stock, remove any seedlings before they become perennial plants, and prevent any plants from producing seed. If topsoil is introduced to a site, it should be free of roots, rhizomes, seeds, and other



Figure 6. Field bindweed (left) and the larger flowers of western morningglory (right).



Figure 7. Field bindweed plants developing from underground roots or rhizomes don't have seed leaves.



Figure 8. Field bindweed seeds.

bindweed propagules. It is important to control new infestations when they are small, because spot control is the least expensive and the most effective strategy.

Cultural Control

Experiments in some annual and perennial crops have demonstrated the effect of shade on bindweed growth. In these studies, alfalfa, cereal grains, sorghums, and corn partially reduced bindweed growth. Shade from shrubs and trees also should reduce growth, especially if there is another planting under the trees and the bindweed isn't allowed to climb above the foliage of these plants.

Seedlings of field bindweed are easy to control with cultivation, but only for about 3 to 4 weeks after germination. After that, perennial buds are formed, and successful control is much more difficult.

Cultivation or hoeing has been partially effective in reducing established stands of field bindweed. Cultivate about every 2 to 3 weeks and repeat whenever necessary. In conjunction with cultivation, withholding water to dry the site might help to reduce the perennial population in a summer season, assuming the roots have not tapped into deep moisture.

Landscape fabrics such as polypropylene and polyester and other mulches such as black plastic or cardboard have been effective for bindweed control if no light is allowed to reach the soil and the plant. The edges of the fabric must overlap so that the bindweed stems can't grow between the sheets and into the light. If holes are made in the fabric or plastic for plants, however, bindweed can also grow through these holes. A landscape fabric placed over soil then covered with bark or other plant-derived product (e.g., organic matter) or rock will likely keep field bindweed from emerging. It might take more than 3 years of light exclusion before the bindweed dies. Once landscape fabric or other mulch is removed, new bindweed plants might germinate from seed in the soil; be sure

to monitor the site and control any new seedlings. Complete death of the plant under the mulch takes 3 to 5 years.

Chemical Control

Herbicides have been relatively effective for suppression of bindweed but have been only partially effective for eradication (Table 1). If herbicides are used, supplementing them with appropriate preventive and cultural controls has the most success in eradication.

Turfgrass areas. In turfgrass areas field bindweed normally isn't a problem because frequent mowing reduces its vigor, though once established it will persist. Mowing the turfgrass won't get rid of established bindweed. Bindweed often will flower above the turf. For control, products containing 2,4-D and/or dicamba have been effective without injuring the grass turf. More than one application will have to be made during the summer growing season.

Ornamental areas. In ornamental landscape settings, field bindweed grows between and up through the canopy of plants. For control, products containing trifluralin, oryzalin, or pendimethalin applied before emergence will reduce new perennial shoots and control the germinating seedlings, but they won't kill

established bindweed plants. In open areas where there are no desirable plants, glyphosate (e.g., Roundup and other formulations) using a 2 percent solution is effective when bindweed plants are actively growing with no moisture stress. Glyphosate takes 2 to 3 weeks, depending upon the temperature at treatment, to kill the top growth, but it is effective, even though eradication isn't always possible. Glyphosate doesn't have residual activity, so repeated applications are necessary. It won't affect germination of field bindweed seed, so new seedlings will have to be controlled with mulch, preemergent herbicides, or persistent cultivation.

Some people have used a 2 percent solution (volume to volume) of glyphosate to paint the leaves of bindweed in shrub areas, but if you try this be sure not to allow the herbicide to touch mature leaves or green bark of ornamental shrubs or trees, or injury can result. To reduce the chance that glyphosate will contact desirable plants, place the bindweed vines on newspaper before painting the leaves. Once the glyphosate solution has dried on the bindweed leaves, the newspaper can be removed. Any regrowth of the field bindweed must be re-treated. Using a shield such as cardboard or wood is advisable while spraying herbicide treatments near ornamental plants.

Table 1. Summary of Herbicides for Use Against Field Bindweed.

| Site | Material | Applied to soil before seeds germinate? | Applied to actively growing plants? | Available for homeowner or professional use? |
|------------------|---------------|---|-------------------------------------|--|
| turfgrass | 2,4-D | no | yes | Found only in combinations for homeowner use. |
| | dicamba | no | yes | Found only in combinations for homeowner use. |
| ornamentals | glyphosate | no | yes | Readily available for homeowner use. |
| | oryzalin | yes | no | Some products available for homeowner use; some for professional use only. |
| | pendimethalin | yes | no | Readily available for homeowner use. |
| | prodiamine | yes | no | Readily available for homeowner use. |
| orchard/vineyard | trifluralin | yes | no | Readily available for homeowner use. |
| | glyphosate | no | yes | Readily available for homeowner use. |
| noncrop areas | trifluralin | yes | no | Readily available for homeowner use. |
| | dicamba | no | yes | Found only in combinations for homeowner use. |
| | 2,4-D | no | yes | Found only in combinations for homeowner use. |
| | glyphosate | no | yes | Readily available for homeowner use. |

If an area infested with bindweed is to be planted, irrigate the area to make the bindweed grow well, then treat the field bindweed with glyphosate before planting. After planting, use an appropriate preemergent herbicide or mulch and continue to control any seedlings or regrowth from the previously treated plants.

Orchard and vineyard areas. In orchards or vineyards where bindweed is growing beneath the branches or canes, glyphosate can be applied safely to the bindweed under the woody crop plants without injuring them, as long as tree suckers or low hanging branches aren't sprayed. For best control, apply glyphosate to the bindweed in fall when the bindweed is actively growing; however, spring treatment has the additional benefit of reducing seed production, vigor, and spread of the plant. Generally, additional applications need to be made when the bindweed regrows.

Seedlings must be controlled with mulch, tillage, or preemergent herbicides before they become established plants. Repeated cultivations are required to prevent bindweed from reestablishing. Because the seed lasts such a long time in the soil, control practices must be conducted continuously. See the UC IPM Pest Management Guidelines for grapes or specific tree crops for more information on managing weeds, <http://www.ipm.ucdavis.edu/PMG/crops-agriculture.html>.

Noncrop areas. In areas outside the landscape or orchard, cultivation and herbicide treatment can be used. If herbicides are to be used, treat the bindweed plants before they are drought stressed. Use a translocated herbicide, such as glyphosate, or a combination of glyphosate and dicamba, in areas where its use is allowed, when the plant is actively growing. There is a plant-back interval to crops based on the crop to be planted. Re-treatments will be necessary to control both established plants and seedlings. If

possible, grow a competitive planting of other plants to reduce field bindweed growth and a crop that has herbicides available to use.

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AUTHORS: S. D. Wright, UC Cooperative Extension, Tulare/Kings Co.; C. L. Elmore, Plant Sciences emeritus, UC Davis; and D. W. Cudney, Botany and Plant Sciences emeritus, UC Riverside.

TECHNICAL EDITOR: M. L. Flint

EDITOR: M. L. Fayard

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Pesticides are poisonous. Always read and carefully follow all precautions and safety recommendations given on the container label. Store all chemicals in the original, labeled containers in a locked cabinet or shed, away from food or feeds, and out of the reach of children, unauthorized persons, pets, and livestock.

Pesticides applied in your home and landscape can move and contaminate creeks, rivers, and oceans. Confine chemicals to the property being treated. Avoid drift onto neighboring properties, especially gardens containing fruits or vegetables ready to be picked.

Do not place containers containing pesticide in the trash or pour pesticides down the sink or toilet. Either use the pesticide according to the label, or take unwanted pesticides to a Household Hazardous Waste Collection site. Contact your county agricultural commissioner for additional information on safe container disposal and for the location of the Household Hazardous Waste Collection site nearest you. Dispose of empty containers by following label directions. Never reuse or burn the containers or dispose of them in such a manner that they may contaminate water supplies or natural waterways.

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