

Winning the Battle Against Horseweed and Hairy Fleabane in California

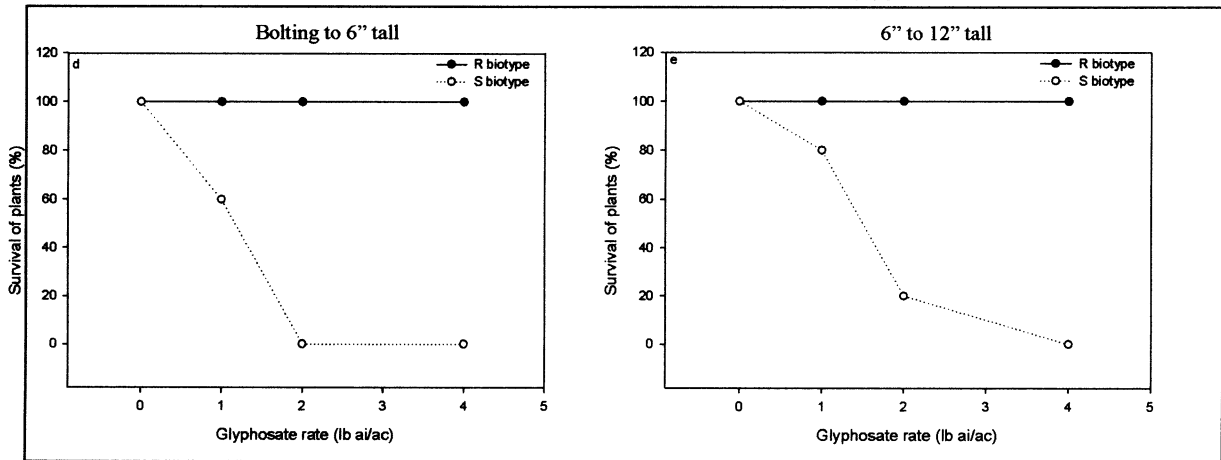
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Horseweed or mare's tail (*Conyza canadensis*) and hairy fleabane (*C. bonariensis*) have become major, wide-spread weed pests for tree and vine growers throughout California. They favor warm, irrigated conditions, but are also common along road sides, irrigation ditches, railroad tracks, and other rights-of-ways where moisture and soil disturbance is limited. Some reasons for their increase in numbers in orchard and vineyard settings include: 1) reduced weed control inputs, especially when crop prices have been depressed, 2) reduced use of effective soil-residual herbicides, particularly in newer regulated ground water protection areas (GWPA), 3) increased degradation of soil-residual herbicides under low-volume irrigation, and 4) poor timing of postemergence sprays.

In 2005, glyphosate-resistant horseweed was found in California along an irrigation canal system in northern Tulare County, which might account for these weeds escaping control in some locations. In our findings, the horseweed biotype was resistant to glyphosate when treated at more than 4X the recommended label rate (Figure 1). Including California, there are now 11 states that have horseweed populations resistant to glyphosate in the USA. Hairy fleabane resistance to glyphosate has only been documented in South Africa and Spain. Studies are currently underway in California to determine if glyphosate-resistant hairy fleabane also exists.

Figure 1. Susceptibility of resistant and non-resistant horseweed biotypes to glyphosate in California



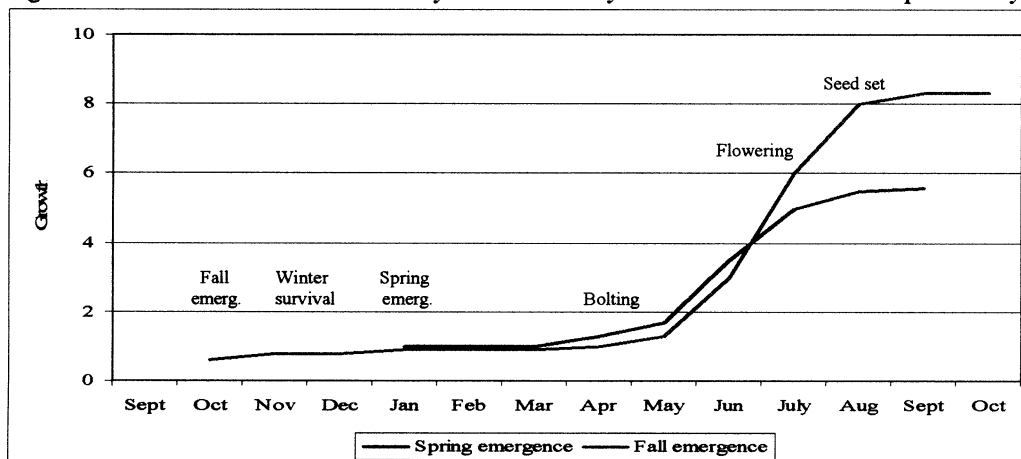
Horseweed and hairy fleabane are summer annual weeds belonging to the Asteraceae (sunflower) family. Unlike most summer annuals, which typically begin germinating in late-winter, these weeds have also been observed emerging in fall (October/November) (Figure 2). Fall-emerging plants appear to go through a vegetative or winter survival stage, similar to

biennials. Bolting for spring and fall-emerging plants appears similar, in about April/May. Although these biotypes may look similar in size in the spring, fall-emerging plants may have larger root systems, possibly explaining the poor control with certain postemergent herbicides, like glyphosate. Flowering and seed production seem to vary slightly, with hairy fleabane beginning in June/July and horseweed delayed 30-60 days or more after that.

Both species produce large amounts of seed (horseweed >200,000 and hairy fleabane >10,000) that is dispersed in wind currents. The hairy pappus on the seed, allow the seed to travel distances of ¼ mile or more, much like that of dandelion. Well traveled roadways throughout the state facilitate their spread. Unlike most other weeds, these do not require a period of dormancy to germinate, making it difficult to predict emergence. Mature seed falling to the soil in late-summer can sprout as soon as moisture becomes available. They prefer undisturbed soils, such as tree and vine rows, which are easily warmed during the day. Seed burial and debris on the soil surface seem to discourage germination. Seed survival is about 3 years or less under most conditions.

The physical structure of the two species contributes to their ability to survive postemergence sprays. Horseweed grows upright, 7' tall or more as a single stem, while hairy fleabane grows to about 2-3' tall and has no central stem. Their stems are somewhat woody. Both species have leaves that are fairly narrow, covered with fine hairs. In hairy fleabane, leaves are often <1 cm wide and somewhat crinkled, making spray coverage difficult. Where populations of these weeds are dense, thorough spray coverage of the entire plant is difficult to achieve. Therefore, it is not recommended to wait to treat these plants when they become large.

Figure 2. Observed horseweed and hairy fleabane life-cycles in the central San Joaquin Valley.



In order to control these weeds, it is important to have a good understanding of some of these important growth and development characteristics. Some practices that will aid in their eradication include:

- Do not let these plant produce seed.

- Apply preemergence herbicides emergence in the fall and/or winter. If applying simazine, diuron, bromacil, or norflurazon in a GWPA, obtain a permit from the county agricultural commissioner.
- Apply postemergent herbicides when these weeds have <18-21 leaves (see table). If using glyphosate (Roundup, etc.) it to control these weeds, use at least 2 lb ai/acre for maximum control. Proper surfactants and additives should be used where appropriate according to the label. Tank-mixing certain postemergent herbicide products can also improve control.
- Use appropriate spray nozzles and spray volume to give proper coverage of the target weeds. When weed canopy is dense, consider TwinJet or similar nozzles that will provide wetting of the entire plant, including any stems.
- Never rely on a single herbicide program year-after-year, as this often leads to a shift to troublesome weeds, like horseweed and hairy fleabane; consider herbicide rotation.
- Closely monitor weed escapes and control those missing treatment.
- Repeated mechanical disturbance of the soil discourage these weeds. In-row cultivators are effective on these weeds if treated while they are in the seedling stage. Mowing and flaming do not appear to be effective methods of control and may acerbate the problem.
- Where the population is sparse, use a shovel or other hand equipment for removal, being sure to cut below the soil surface to cut the roots.
- If you suspect herbicide-resistant horseweed or hairy fleabane, contact your local extension agent to help alleviate the problem.

Table. Some herbicides registered in California in orchards and vineyards for horseweed and hair fleabane control.

Preemergence herbicides	Lb ai/A	Horseweed control	Hairy fleabane control
bromacil (Hyvar X®)	3.2	Excellent	Good
bromacil + diuron (Krovar®)	3.2	Excellent	Excellent
diuron (Karmex®, Direx®)	2.5	Good	Good
epc (Eptam®)	3.0	Excellent	Good
flumioxazin (Chateau®)	0.375	Good	Fair
isoxaben (Gallery T&V®)	1.0	Excellent	Excellent
norflurazon (Solicam®)	2.0	Fair	Fair
oxyfluorfen (Goal 2XL®, Galigan®, etc.)	2.0	Fair	Poor
simazine (Princep®, Caliber 90®, etc.)	2.5	Excellent	Good
simazine + diuron	1.5 + 1.5	Excellent	Excellent
thiazopyr (Visor®)	1.0	Fair	Fair
Postemergence herbicides	Lb ai/A	Horseweed	Hairy fleabane
glufosinate (Rely®) + AMS	1.0 + 10 lb/100 gal	Excellent*	Excellent*
glyphosate (Roundup Weathermax®, Touchdown®, etc.)	2.0	Excellent*	Good to Excellent*
paraquat (Gramoxone Max®, etc.)	2.0	Excellent*	Good to Excellent*
2,4-D (Orchard Master®, Dri Clean®, etc.)	1.4	Excellent*	Excellent*

*Assumes treatment when weeds are small (<21 leaves) with thorough coverage
 Always read and follow all label recommendations. Other effective products may be available, but not listed in this table.

There is little doubt that horseweed and hairy fleabane populations are on the increase in California. To help resolve this problem, one needs to become familiar with some of the important characteristics of these weeds and implement an appropriate strategy. To be successful, identify these weeds early and apply appropriate treatments when they are most vulnerable to control and do not let them go to seed. Since these weeds can emerge in the fall and in the spring, it may be necessary to split preemergence treatments to catch the different emergence periods. When using postemergence herbicides, treat when they have fewer than 21 leaves or control will be greatly reduced. Thorough wetting of the weed foliage is necessary for effective control of larger weeds. Disturbing the soil mechanically can impede seed germination and cultivating when weeds are small can give effective control. Additionally, implementing control practices along field margins, fence lines, road sides, and canal banks are essential components for eradication.

Suggested readings

- Grower's weed identification handbook. DANR Pub. 4030. Coop. Ext., Univ. of Calif.
Principles of weed control in California. 3rd ed.. CWSS. Thompson Publications.
VanGessel, M.J. 2001. Glyphosate-resistant horseweed from Delaware. *Weed Sci.* 49:703-705.
Weaver, S. E. 2001. The biology of Canadian weeds. 115. *Conyza canadensis*. *Can. J. Plant Sci.* 81:867-875.