

INTRODUCTION

Marestail (*Conyza canadensis*), also known as horseweed or Canada fleabane, is a common winter or summer annual broadleaf weed found in nurseries, greenhouses, landscapes, roadways, meadows, turfgrass, and crops. It is problematic due to vast seed reproduction in two cycles, wind dissemination, lack of seed dormancy, and adaptability to both moist and dry soils. Marestail biotypes are resistant to many herbicides, including glyphosate (Roundup), gramoxone (Paraquat), atrazine, simazine (Princep), and diuron (Karmex), and cloransulam-methyl.¹¹



First seedlings of marestail are emerging
 Photo: Bruce Ackley, The Ohio State University, Bugwood.org

IDENTIFICATION

Seedlings initially grow as a ground hugging rosette and have simple, oval leaves with scalloped edges. A central flowering stalk forms ('bolts') in spring or summer with alternate, sessile (no petioles), 1-4" toothed, willow-like leaves (1/2" in diameter⁹ which become progressively smaller up the stem¹⁰). The tall (4-6+ ft. stem) branches to flower in terminal clusters (resembling a horse's tail).⁶ Small (pea-sized), white, daisy-like flowers in the summer form seedheads similar to tiny dandelion puffballs that produce thousands of wind dispersed seeds. Marestail can be misidentified as mouse-ear chickweed, shepherd's purse, or annual fleabane.



First seedlings of marestail are emerging
 Photo: Joseph M. DiTomaso, University of California-Davis, Bugwood.org



The main stem bolts and will produce a flower head later in the season

Marestail seeds germinate in either the fall or the spring (therefore it is considered both a winter and summer annual weed). On Maryland's Eastern Shore, most marestail seeds germinate in the fall (September-November) and survive through the winter in a vegetative rosette stage. On Maryland's Western



Marestail flowers are small and daisy-like
Photo: Mary Ellen (Mel) Harte, Bugwood.org

Shore, most seeds germinate during the spring (late March through June).¹⁵ While these biotypes may appear similar in size in the spring, fall-emerging plants have larger root systems (hence control difficulties with certain postemergent herbicides).⁴



A marestail plant can produce thousands of seeds
Photo: Bruce Ackley, The Ohio State University, Bugwood.org

Intermittent germination may occur anytime except under hot summer temperatures. Fall biotypes bolt earlier (in late April)¹⁵ than the spring-emerging plants that flower beginning in late June and produce mature seeds from August through early October. Spring biotypes begin bolting in midsummer. One mature marestail plant is able to produce up to 200,000 seeds that are wind transported. Most seed (86%) germinates quickly.⁷ Seed is relatively short-lived (only up to 3 years) in the soil seed bank.¹⁴

MANAGEMENT ISSUES

- Marestail emerges very early in the spring (=Weed Group 0) and is present before crops are planted (GDD17 <150 (base 48 °F)).
- Marestail tolerates drought conditions well and continues to grow and produce seed under environmental conditions too stressful for growth of many other plants,¹¹ preferring undisturbed soil. Conversely, marestail is not very shade-tolerant.⁷
- One mature plant produces an average of 200,000 wind-blown seeds that can be dispersed long distances and are capable of traveling distances >¼ mile.⁴ One study found 125 seeds per yd² at 400 feet away from the seed source.⁷
- Seeds do not require a period of dormancy to germinate, making it difficult to predict emergence. Mature seed falling to the soil during late summer/fall can sprout as soon as adequate moisture becomes available (usually with the first rains).⁴
- Marestail seedlings germinate earlier than other winter annuals – hence pre-emergent herbicides must be applied by early August. Fall seedlings that overwinter can be more difficult to control than those that emerge during early spring.¹¹
- Removing mature plants (to prevent production of seed heads) helps considerably in long-term control, particularly to prevent new weed introduction from neighboring fields.
- Herbicide effectiveness against horseweed significantly lessens after plants are >6" tall and the stem begins elongating/bolting.¹⁴
- Marestail can be a host for the tarnished plant bug¹¹ and a host for aster yellows (a viral disease transmitted by leafhoppers to several ornamental plants).

CONTROL

Cultural Control

- Use only well composted organic amendments from certified composting facilities that are considered to be weed-free.
- Use weed barriers/Geotextile ground fabrics under containers as a weed free barrier in the greenhouse or nursery container areas.
- Mulch landscape beds to control germinating marestail by depriving them of light. For bedding plant areas that are to be transitioned two or three times a year, use a fine-textured organic mulch.
- Solarize the area to heat the soil in an effort to kill weed seeds.
- Rototill beds in the summer under long days and peak sunlight and temperatures, and then cover with clear plastic for 6-8 weeks.

Mechanical Control

- Remove marestail seedlings when they are small, before they flower and go to seed. Hoeing, hand weeding, or tilling can be effective, especially in container nursery crops, and is the only option for removing large weeds.
- Remove larger weeds entirely, since marestail can re-sprout from broken stems.¹¹ Cut the plant root below the soil surface.
- Control weeds in adjacent fields/beds¹² to prevent seed spread/new weed introductions.
- Tillage equipment can spread marestail in field nurseries. Clean equipment (tillers, tractors) before use or between fields with high pressure water or compressed air, to prevent spreading cut vegetative pieces/propagules.¹

Biological Control

- A strain of the bacterium *Xanthomonas campestris*, was shown to be effective in controlling glyphosate resistant marestail in greenhouse experiments.
- The USDA has a research project currently studying the effect of the fungal plant pathogen, *Myrothecium verrucaria* on marestail in corn, co-applied with a surfactant as a directed spray.³

Chemical Control*

The timing of herbicide applications is extremely important in order to achieve acceptable control of marestail. Herbicides should be applied when weeds are small and most vulnerable to control (preferably in the seedling or rosette stage --- < 4" tall, and prior to flowering). Since marestail can germinate in the fall and in the spring, it may be necessary to split pre-emergent treatments to catch the different germination periods.

PRE-EMERGENT HERBICIDES: Follow label directions.

Pre-emergent herbicides are applied before weeds emerge. Because marestail seeds germinate before other winter annuals, a commercial pre-emergent treatment may not fit into other "scheduled" commercial herbicide application times. Fall pre-emergent treatments for marestail should be applied by early August to prevent seed germination in the fall. Spring pre-emergents should be applied by mid-to-late March.¹²

In a container nursery production cycle, herbicide application timing is important: 1) during liner propagation, 2) site preparation before setting containers on ground, 3) at potting, 4) approximately one month after potting.

SureGuard (flumioxazin) offers effective pre-emergent control of glyphosate resistant marestail.⁵ In the nursery, avoid over the top applications with most plants (check the label) It is safest to apply SureGuard to one year old and older spaced tree transplants with no green bark on the lower stem.

Annual landscape flower beds: Apply pre-emergent herbicides after transplanting to weed-free soil. Mulch the bed before herbicide application if possible, applying herbicide to moist mulch. Granular formulations of herbicides are safer to bedding plants than spray formulations. Bedding plant foliage should be dry at the time of application to prevent herbicide granules from sticking to the foliage. Irrigate after treatment to wash granules off of the plants and to “activate” the herbicide.

Greenhouse: Pre-emergent herbicides should be applied by early to mid August (or prior to applying the poly coverings to the overwintering houses).¹²

For nursery/greenhouse growers, herbicides labeled include Barricade, SureGuard (flumioxazin), and Snapshot. Freehand 1.75 G (1% pendimethalin and 0.75% dimethenamide) reportedly works well for summer pre-emergent applications.

POSTEMERGENT HERBICIDES: Follow label directions

Post-emergent herbicides are applied to germinated weeds. Marestalk is most effectively controlled in the seedling/rosette stage. Residual herbicides applied at these stages can provide control through early June.¹¹ Alternatively, burndown herbicides can be applied up to when plants are 4-6” tall (with < 21 leaves¹¹; mid-to-late May), or before weeds reach the stem elongation (bolting) period. Postemergent herbicides applied to marestalk should contain three to four sites (mechanisms) of action to manage glyphosate-resistant marestalk.¹³ Do not rely solely on glyphosate to control emerged marestalk due to resistance issues.

Pre-planting (for bed preparation): Options for fall or early spring herbicide applications include Paraquat, dicamba, 2,4-D LV ester, and glyphosate to control small newly germinated weeds. Use at least two different herbicide modes of action¹⁴ in burndown applications). Fall-applied (mid-October to mid November) postemergent herbicides may provide more effective control of emerged marestalk than spring-applied herbicides¹⁶. Multiple burn-down applications consist of both fall and spring treatments. Fall applied herbicides may not adequately control spring-emerging plants;¹¹ spring applications prior to early May should also include a residual herbicide to control later-emerging plants.

Roadsides/Rights-of-way:

Aminopyralid (Milestone). Do not allow drift to desirable vegetation. Many desirable broadleaf plants can be seriously injured or killed. Do not exceed 7 fl oz/A Milestone per year.

Clopyralid (Reclaim, Stinger, Transline, Confront, Lontrel, Curtail, Millennium Ultra); residues in grass clippings, straw, leaves, manure and bedding, and finished composts have been found to cause injury to other plants (<http://ohioline.osu.edu/aex-act/0714.html>)

Dicamba (Banvel, Banex, Trooper)

*Disclaimer: Complete reliance on any one herbicide may lead to resistance and population shifts. The listed chemicals exhibit activity against this weed; however, chemicals exhibiting activity will not always provide complete control. Tank-mixing more than one chemical often will improve efficacy, as will delivering sequential applications of a single chemical. Always use pesticides according to directions on the label.

REFERENCES

1. Atland, J. 2005. Weed control in Nursery Field production. Oregon State University Extension Service EM8899-E. http://oregonstate.edu/dept/nursery-weeds/feature_articles/em8899.pdf
2. Bernard, C.S. et al. 2012. Weeds of Container Nurseries in the United States. NC State University. <http://www.cals.ncsu.edu/plantbiology/ncsc/containerWeeds/>; http://www.cals.ncsu.edu/plantbiology/ncsc/containerWeeds/Conyza_canadensis.htm
3. Boyette, Clyde. 2012. Improvement of Bioherbicide Strategies for Invasive Weeds in Southern Cropping Systems. USDA-ARS 2012 Annual report, Biological Control of Pests Research Unit. http://www.ars.usda.gov/research/projects/projects.htm?ACCN_NO=421244&fy=2012
4. Hembree, K and A. Shrestha. 2005. Biology, Identification, Losses, and Control Options for Horseweed and Hairy Fleabane in Tree and Vine Crops in California's Southern San Joaquin Valley. University of California cooperative Extension Fresno County Weed management web site, http://ucanr.org/sites/weed_management/files/71041.pdf.
5. Holcomb, M. Field Nursery Weed Control. Tennessee Commercial Nursery Production Information website http://www.utextension.utk.edu/mtnpi/handouts/Weed%20Control%20for%20Container%20&%20Field/Field_Weed_Control_rev_A.pdf
6. Horseweed (marestail) - *Conyza canadensis*. 2006. Michigan State University Extension online fact sheet- Diagnostic Services: weeds and plant identification. <http://www.pestid.msu.edu/WeedsPlantIdentification/Horseweedmarestail/tabid/134/Default.aspx>
7. Horseweed (Marestail) (*Conyza canadensis* (L.) Cronq.) 2014. MSU Weed Science: Worst Weeds. Michigan State University Dept. of Crop and Soil Science online. <http://www.msuweeds.com/worst-weeds/marestail/>
8. Horseweed- *Conyza canadensis*. Tennessee Turfgrass Weed fact sheet, University of TN online. <http://www.tennesseeturfgrassweeds.org/pages/weed.aspx?WID=32&Name=Horseweed>
9. Horseweed. NC State TurfFiles Center for Turfgrass Environmental Research & Education (CENTERE). <http://turfid.ncsu.edu/csPagedPdField.aspx?PlantID=ERICA>
10. Horseweed or Marestail (*Conyza canadensis*) 2009. IPM1007, Practical Weed Science for the Field Scout: Corn and Soybean. University of Missouri Extension online <http://extension.missouri.edu/p/ipm1007-67>
11. Loux et al., 2004. Biology and Management of Horseweed. Purdue Extension Fact Sheet ID-323.
12. Mathers, H. 2013. "Dirty Deeds Done Dirt Cheap" –er: Container Nursery Weed Control. Presentation at FarWest Seminar.
13. Neal, Joseph. 2007. Weed Management in Annual Color Beds. N.C. State University Horticulture Information Leaflet HIL-644 (online). <http://www.ces.ncsu.edu/hil/hil-644.html>.
14. Recommendations for Management of Glyphosate-Resistant Horseweed (Marestail) in Illinois Soybean. Online fact sheet, University of Illinois Extension. http://www.ilsoy.org/_data/files/yieldchallenge/Weed%20Management/Glyphosate%20ResistanceHW.pdf
15. Ritter, Ronald. Horseweed Management. UME Agronomy News, Vol 2, No. 2, May 2011.
16. University of Illinois Extension. 2013. 5 tips for fall herbicide application to control marestail. Corn and Soybean Digest. Oct 7. http://cornandsoybeandigest.com/crop-chemicals/5-tips-fall-herbicide-application-control-marestail?NL=SO-02&Issue=SO-02_20131009_SO-02_112&YM_RID=jpohl%40effinghamequity.com&YM_MID=1425792&sfvc4enews=42
17. Weed Emergence Sequences. Iowa State University Extension IPM-64. <http://ipm.illinois.edu/weeds/WeedEmergePoster.pdf>

By:

Deborah Smith-Fiola, Independent IPM Consultant, Landscape Enterprise, LLC

**Stanton Gill, IPM Extension Specialist,
Central Maryland Research and Education Center**

The information given herein is supplied with the understanding that no discrimination is intended and no endorsement by University of Maryland Extension is implied.
Read labels carefully before applying any pesticides.

Photographs are by Suzanne Klick and Stanton Gill unless stated otherwise.

The University of Maryland, College of Agriculture and Natural Resources programs are open to all and will not discriminate against anyone because of race, age, sex, color, sexual orientation, physical or mental disability, religion, ancestry, or national origin, marital status, genetic information, or political affiliation, or gender identity and expression.