Marestail Control in Kansas

K-STATE Research and Extension

With an increase in no-till crop production throughout central and eastern Kansas, new weed-control challenges are emerging. A major problem in no-till cropping systems is effectively controlling marestail (*Conyza canadensis* (L.) Cronq.) also known as horseweed or Canadian horseweed (Bruce and Kells 1990; Swanton et al., 1993).

Marestail, a native to the United States, is considered either a winter or summer annual that is often difficult to identify.

Marestail is a dicotyledon plant that has small, round cotyledons following emergence (Oliver, 2004). The first leaves of marestail have a broad, round end and have a whorled leaf arrangement that forms a rosette. Small plants may be green or purple during cool weather. The first leaves generally have a smooth leaf margin, while later leaves often have an irregular-toothed margin. Roots of marestail are fibrous.

After the rosette stage, the marestail bolts with a hairy stem. Leaves on the main stem are alternate, hairy, 1 to 4 inches long, linear to oblanceolate (widest near the leaf apex) in shape, and attached directly to the main stem. Similar to rosette leaves, leaf margins on the main stem are either entire or toothed. Plants generally reach 3 to 6 feet tall.

Marestail seed heads are arranged in numerous small heads in an elongated panicle. Individual small flowers are white, while the center of the bloom is yellow. Seeds are small (about 1/32 inch) and a yellow to tan color. Attached to the apex of the seed are numerous slender white bristles that form a tuft-like structure that enable wind-aided seed dispersal.

Marestail is generally considered a winter-annual weed; however, it can germinate 8 to 9 months out of the year (Regehr and Bazzaz, 1979; Davis and Johnson, 2008). Depending on geography, marestail tends to germinate in the fall in the northern regions of the United States and in the spring in the southern regions (Buhler and Owen, 1997; Davis and Johnson, 2008). Marestail survival through the winter can range from 20 to 91 percent and vary by rosette size, soil type, and environmental conditions (Buhler and Owen, 1997; Davis and Johnson, 2008).

Since Kansas is in the middle of the United States, marestail may germinate more in the fall in northern Kansas, and spring flushes may be more common in southern Kansas. This can be important when planning for marestail control and herbicide choice. The biology of marestail may be shifting toward spring and summer germination in response to our cropping systems and herbicide use patterns.

Fall-germinated marestail overwinters in the rosette stage and bolts in the spring before seed production (Figure 1). Often, spring-germinated marestail spends little to no time in the rosette stage, proceeding to the bolted stage soon after emergence (Regehr and Bazzaz, 1979).

Marestail can produce 200,000 seeds per plant (Bhowmik and Bekech, 1993). Because the main mechanism of seed dispersal is by wind, it can spread over great distances. Marestail seed can reach altitudes in excess of 450 feet (Shields et al., 2006). Considering the slow settlement velocity of 1.1 feet per second (Dauer et al., 2006), a single seed at a 450 foot altitude could easily travel more than 100 hundred miles in a single flight with moderate wind speeds.

Figure 1. Growth stages of marestail from seedling, rosette, to bolting state.

Figure 2. Typical visual symptoms of glyphosate-tolerant marestail.

Marestail is fairly easy to control with many herbicides when plants are small and in the rosette stage. When plants begin to bolt or shoot a main stem rapidly in the spring, however, the ability to get effective control with herbicides is greatly reduced. Therefore timing of control of marestail is critical and, depending on growth stage, herbicide selection will be just as important to achieve successful control.

Since the mid-1990s, marestail has developed herbicide resistance to five herbicide modes of action including glyphosate (Figure 2), paraquat, atrazine, ALS-inhibiting herbicides (i.e. Classic and FirstRate), and diuron across 20 states including Kansas (Heap, 2011). With the relative ease of development of herbicide resistance, difficulty in controlling bolted plants, and the widespread dispersal of seed, marestail is a major challenge for no-till soybean and cotton producers in Kansas.

Glyphosate-resistant marestail populations are becoming more common in Kansas; however, management strategies can be implemented to control resistant populations. Davis et al. (2009) evaluated several practices and their influence on the incidence of resistant individuals in a naturally occurring glyphosate-resistant marestail population. Practices that included spring herbicide applications, residual herbicides, herbicides with alternative modes of action to glyphosate, and non-glyphosate postemergence herbicides had the greatest influence of shifting the population from resistant to more susceptible individuals.

Control in Corn and Sorghum

Fortunately, several options exist to control marestail in reduced-till or no-till corn and grain sorghum. Atrazine, one of the most widely used herbicides on corn and sorghum, effectively controls marestail, both as a preemergence application and when applied to small seedlings. As plants bolt in the spring, the effectiveness of atrazine declines. Caution on repeated use of atrazine as the sole alternative herbicide needs to be considered since marestail has the ability to develop resistance to atrazine as well (Gressel, 1982).

Growth regulator herbicides such as dicamba, 2,4-D, and fluroxypyr also are effective for control of marestail and are often tank-mixed with atrazine to provide more consistent control than atrazine alone. The HPPD inhibiting, or "bleacher," herbicides such as Lumax, Lexar, Callisto, Balance, Corvus, Capreno, Laudis, and Impact are generally effective for marestail control in corn. Of these, only Lumax and Lexar can be used in sorghum. There are several ALS-inhibiting herbicides that have efficacy against marestail for both corn and sorghum, unless the marestail are ALS-resistant.

Control in Wheat

As with corn and sorghum, there are several effective herbicides that control marestail in wheat. Growth regulator herbicides such as dicamba, MCPA, 2,4-D, or Starane can effectively control marestail in wheat (Table 1.). In addition, several ALS-inhibiting herbicides containing Ally, Glean, or Amber give excellent control of marestail, unless they are ALS resistant. Huskie, which is a combination of pyrasulfotole, an HPPD inhibitor, and bromoxynil, is also effective at managing marestail.

Control in Soybeans

Controlling marestail in soybeans has been a challenge for central and eastern Kansas no-till producers. Because soybeans are generally planted later in the season, and marestail germinates in the fall or early spring, application timing and weed size are critical factors to successful control.

In early spring, using a growth regulator herbicide like 2,4-D or dicamba is an inexpensive and effective option to control rosette marestail (Table 2). In addition, using an herbicide with residual control of marestail helps with weeds that germinate between fall and early spring burndown and soybean planting. Products that include Canopy EX, Classic, FirstRate, Sharpen, or Valor can help provide residual control against several broadleaf species including marestail.

Table 1. Marestail control with fall and late spring treatments for wheat at Winfield in 2010.

Treatment	Application			April 15	May 19
	Rate	Stage	Date	(% control)	
Banvel	8 fl oz	Rosette	Dec 21	99	100
Huskie	15 fl oz	Rosette	Dec 21	92	84
Finesse	0.4 oz	Rosette	Dec 21	91	90
Rave	4 oz	Rosette	Dec 21	100	100
Powerflex	3.5 oz	Rosette	Dec 21	67	55
Harmony SG	0.9 oz	Rosette	Dec 21	75	63
Starane Ultra	6.4 fl oz	Rosette	Dec 21	48	34
Huskie	15 fl oz	Bolted	April 8	70	100
Finesse	0.4 oz	Bolted	April 8	29	88
Powerflex	3.5 oz	Bolted	April 8	30	80
Harmony SG	0.9 oz	Bolted	April 8	31	76
Starane Ultra	6.4 fl oz	Bolted	April 8	54	85
LSD (5%)				**21**	**24**

Table 2. Suspected glyphosate-resistant marestail control with early preplant and preemergence treatments at Clearwater in 2009.

Treatment	Application			May 21	June 3
	Rate	Stage	Date	(% control)	
Roundup PowerMax	22 fl oz	Rosette	April 21	74	73
Roundup PowerMax + 2,4-D	22 fl oz + 16 fl oz	Rosette	April 21	89	91
Roundup PowerMax + 2,4-D	22 fl oz + 32 fl oz	Rosette	April 21	98	98
Roundup PowerMax + Clarity	22 fl oz + 4 fl oz	Rosette	April 21	95	93
Liberty	22 fl oz	Rosette	April 21	77	80
Liberty	29 fl oz	Rosette	April 21	94	100
Roundup PowerMax	22 fl oz	Bolted	May 21	-	68
Liberty	29 fl oz	Bolted	May 21	-	97
Gramoxone Inteon	40 fl oz	Bolted	May 21	-	90
FirstRate	0.3 oz	Bolted	May 21	-	58
LSD (5%)				**16**	**21**

Table 3. Postemergence marestail control in soybeans at Manhattan in 2009.

Treatment	Rate	1 WAT*	5 WAT	10 WAT
			(% control)	
Roundup PowerMax	22 fl oz	30	57	57
Roundup PowerMax	44 fl oz	37	60	57
Cadet	0.9 fl oz	20	0	0
Roundup PowerMax + Cadet	22 fl oz + 0.9 fl oz	50	47	47
FirstRate	0.3 oz	47	73	63
Roundup PowerMax + FirstRate	22 fl oz + 0.3 oz	47	87	95
Classic	0.5 oz	53	53	40
Roundup PowerMax + Classic	22 fl oz + 0.5 oz	53	73	77
Raptor	4 fl oz	30	27	17
Roundup PowerMax + Raptor	22 fl oz + 4 fl oz	40	70	65
LSD (5%)		**6**	**10**	**8**

*WAT = Weeks After Treatment

As soybean planting nears, marestail control can become difficult because plants will have bolted and be considerably larger. Herbicides to apply as a burndown before planting include tank mixes of glyphosate with FirstRate, Classic, Gramoxone, Sharpen, Optill, or 2,4-D (Table 2). Follow label directions when using 2,4-D before soybean planting because the plant-back restriction ahead of soybean can be 7 to 30 days. Sharpen is a relatively new herbicide that has provided good marestail control and can be applied any time before soybean emergence. Maximize marestail control by applying Sharpen in combination with methylated seed oil and at spray volumes of 15 gallons per acre or more.

One additional herbicide that has provided good burndown control of bolted marestail is Liberty. In several K-State studies, Liberty provided good control of both rosette and bolted marestail at the 29-ounce-per-acre rate. Liberty has no soybean plant-back restriction. Liberty also has broad-spectrum nonselective activity on other broadleaf and grass species if treated at a young growth stage. Liberty is primarily a contact herbicide, so spray volumes of 15 gallons per acre or greater generally provide the most consistent weed control. Liberty also tends to work better with higher humidity and warm sunny conditions at application.

Controlling marestail in soybeans can be the biggest challenge for producers. Glyphosate alone is often not effective on larger or glyphosate-resistant marestail. The most successful treatments for control of large marestail in Roundup Ready soybeans have been glyphosate tank-mixes with FirstRate, Classic, or Synchrony (Table 3). Another option to help control marestail in fields with a history of marestail problems is to plant Liberty-Link soybeans and use Liberty herbicide. It is important to remember that Liberty can only be applied postemergence on Liberty Link soybeans.

Control in Cotton

Similar to soybeans, marestail has been a major weed problem in cotton. The use of growth regulator herbicides in and around cotton fields during the growing season and just before planting cotton is limited due to the extreme susceptibility of cotton to these herbicides. Thus, timing herbicide applications to control marestail in the fall and early spring is critical for fields to be planted to cotton, especially if glyphosate-resistant marestail is present.

Dicamba, 2,4-D, and Sharpen can be used as fall- or early-spring treatments to control marestail, but the treatments need to be applied early enough to allow the appropriate labeled interval before planting. Dicamba can be applied up to 8 ounces per acre, after which a minimum of 1 inch of rain and a waiting period of at least 21 days is required before planting cotton. A waiting interval of at least 30 days is required following 2,4-D at 0.5 pound acid equivalent per acre and planting cotton. A waiting interval of at least 42 days and a minimum of 1 inch of rainfall are required before planting cotton following the application of 1 ounce per acre of Sharpen. The inclusion of a residual herbicide such as diuron or Valor helps provide residual control of later-germinating marestail. Diuron can be applied any time before cotton emergence. A waiting interval of at least 21 days between application and planting cotton is required following a 2-ounce-per-acre rate of Valor.

Liberty herbicide can be applied as a burndown treatment to control marestail any time before emergence of cotton, or as a postemergence treatment over the top of Liberty Link cotton. Liberty may be the best alternative to control glyphosate-resistant marestail if cotton will be planted within 21 days of treatment. Liberty cannot be sprayed postemergence on non-Liberty Link cotton.

Summary

- Timing is critical for marestail control.
  - Greater success at controlling marestail with more herbicide options occurs when marestail is in the rosette stage of growth.
  - Controlling marestail after it has bolted is more difficult and there are fewer herbicide options.
- Use glyphosate, 2,4-D, dicamba, Sharpen, ALS-inhibiting herbicides, and/or residual herbicides in fall and early spring burndown in no-till soybeans and cotton.
- For in-crop soybeans, glyphosate tank-mixes with First Rate, Synchrony, or Classic provide the best control of bolted marestail.
- Liberty can provide good control of bolted marestail as a preplant treatment or postemergence in Liberty Link soybeans or cotton.
- Control marestail in wheat with growth-regulator herbicides, ALS-inhibiting herbicide, or Huskie.

- Atrazine, growth-regulator herbicides, and HPPD herbicides can be used to control marestail in corn or sorghum.
- Combining herbicides with good efficacy on marestail often provides the best control.
- Use the full herbicide rates, recommended spray adjuvants, and adequate spray volumes to optimize herbicide performance.

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