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Forage Facts

Controlling Smooth Bedstraw in Hayfields and Pastures

Bulletin #2278

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In late June and early July in New England we see many hayfields and pastures turn white. That white-flowering weed is most likely smooth bedstraw (*Galium mollugo* L.). This perennial weed is spreading at an alarming rate in hayfields and pastures throughout the Northeast, reducing the quantity and quality of your forage crop.

Smooth Bedstraw

Smooth bedstraw is an invasive and opportunistic weed. Its present area of adaptation ranges from southern Canada to as far south as Georgia. Historically, smooth bedstraw is first found in fields that have been poorly managed—hayfields with low fertility and high acidity (low pH), or pastures that have been continuously grazed or underutilized. As farm fields are either abandoned or less intensively managed, we see soils becoming acidic, with fertility dropping and smooth bedstraw proliferating. Smooth bedstraw tolerates low soil nitrogen and low pH better than our desired forage species. Lately, however, we have found smooth bedstraw to be invading better-managed stands of forages (long-term hayfields) and adapting to more variable environmental and soil conditions. Recently, it has been seen growing and thriving in a wide variety of conditions, including on lawns!

Is It Smooth Bedstraw?

Smooth bedstraw is a perennial broadleaf plant with numerous relatively upright stems, and it reproduces both vegetatively and by seed. It has a branching taproot and also produces woody rhizomes that spread horizontally, producing new stems and roots at their nodes. Smooth bedstraw produces white to greenish flowers that appear in late June and early July, and has another flowering period in mid to late August. Individual plants can grow one to three feet tall and spread to three feet or more in diameter, with multiple stems. The plant produces numerous seeds that are easily spread by animals, wind, and rain, providing avenues for this problem weed to enter new fields. Bedstraw can also be spread when seeds are carried from field to field on mowing, baling, and tillage equipment. The "seed rain" will occur after each flowering period (July and August), with the new seedlings most often growing the following spring.

In contrast to the annual catchweed bedstraw (*G. aparine* L.), smooth bedstraw has an almost hairless, smooth stem (hence the name). Its leaf shape and leaf arrangement in whorls is typical for many bedstraw species (see illustration on page one). The leaves are less than one inch long and are arranged in six- or eight-leaf whorls. Smooth bedstraw differs from its close relative, the perennial northern bedstraw (*G. boreale*), which has four longer (one to two inches long) leaves to each whorl. Why is smooth bedstraw a problem? Smooth bedstraw can significantly reduce the yields of

Smooth Bedstraw
height 1 to 3 feet



Illustration by Laura Vogel. Reprinted by permission from Noel H. Holmgren, ed., Illustrated Companion to Gleason and Cronquist's Manual (Bronx, NY: The New York Botanical Garden, 1998, 474.

Smooth bedstraw can significantly reduce the yields of hayfields due to its competitive nature.

hayfields due to its competitive nature. The large-crowned plants quickly dominate fields of timothy, bluegrass, clover, and other cool-season forages. In pasture situations, livestock typically avoid bedstraw, adding to its ability to spread and dominate the forage stand. In New Brunswick, smooth bedstraw has been observed to eliminate 80 to 90 percent of the grass sward in pastures. Smooth bedstraw also contains some chemicals that further reduce forage quality by making it distasteful for animals.

Maine Research Trials in Controlling Smooth Bedstraw

In 2004 and 2005, trials were conducted in Northport, Maine, to evaluate methods to control smooth bedstraw. The research site contained a stand of bedstraw that dominated the pre-existing forage sward.

Parameters and methods

Four methods of control were investigated in a replicated experiment to establish acceptable techniques of controlling this plant. Because smooth bedstraw is rarely found in fields that are intensively rotated between perennial forages and annuals (such as corn silage), the first treatment, a tillage treatment, included a cover crop of buckwheat followed by a bare fallow period during the summer to both kill perennial plants and deplete the weed-seed reservoir in the soil. A second treatment looked at using high rates of nitrogen fertilizer to see if the remaining grasses might be able to utilize the nitrogen and out-compete the smooth bedstraw (as smooth bedstraw is sensitive to shading). We also included a treatment using a systemic herbicide (glyphosate) to kill the bedstraw and the desirable grasses, and reseeded the plot with a no-till drill. This treatment would be applicable to the many fields and pastures in Maine located on shallow soils where tillage is not an option. The final treatment was a late-summer application of Crossbow herbicide (which is a combination of 2, 4-D ester and triclopyr) at three quarts per acre. In all of the treatments, we kept the bedstraw from going to seed during the treatment year. This turned out to be an important consideration in controlling the problem.

What did we find?

The first line of control for smooth bedstraw is to keep the plant from going to seed for a year prior to any attempt to kill the perennial plants. This became very obvious to us from the treatment where we used glyphosate in the spring to kill all existing vegetation, and no-till drilled in a new sod. In this treatment, while we eliminated the existing perennial crowns, we ended up with a new stand of bedstraw seedlings that dominated the new forage stand. Past research has found that smooth bedstraw seed that has dropped to the ground in July and August will germinate and grow the following spring, but will not remain viable for longer periods (Mersereau 2003). Therefore, one strategy for control would involve a two-year process, with the first year focused on eliminating seed rain by either clipping or using a burn-down herbicide, and the second year focused on killing the perennial plant with either tillage or systemic herbicides.

Although nitrogen fertilizer improved the grass growth and yield, the smooth bedstraw also responded with increased plant vigor. Over a longer period, nitrogen fertilization would likely begin to give the grasses a competitive advantage as smooth bedstraw does not tolerate shade very well.

Tillage, a bare fallow, and a buckwheat cover crop controlled both the perennial plant and the new seedlings as they emerged, as we would have expected. This may be the only option for control for organic growers.

The fall application (around late August or early September) of Crossbow also provided excellent control of the perennial plant. Please note that we did control the weed seed rain by mowing before flowering for the entire growing season before using this treatment—this is crucial to success.

In the spring of 2005, stem counts were taken in three subplots within each plot. In the control plot, there was an average of 110 bedstraw stems per 0.25-meter square. The nitrogen-amended plots averaged 127 stems and the glyphosate-treated/no-till plots averaged 215 stems per 0.25-meter square. The tilled plots averaged 2.5 stems and the Crossbow-treated plots had 0 stems per 0.25-meter square. (See [Table 1](#))

Keep bedstraw plants from flowering, setting, and spreading seed, no matter which additional control option you use.

In the second year of the study, we replicated the first year's trial, but added a spring burn treatment where we burned the residual hay from the previous year and also controlled the seed deposition by mowing before flowering in the glyphosate-treated plots. The results indicate that the burning treatment had little impact on controlling smooth bedstraw and that by controlling seed deposition in the glyphosate-treated plots, we effectively managed the weed population. (See [Table 2](#))

Recently, two new herbicide products have come on the market: Milestone and Forefront R&P, which have shown excellent efficacy against smooth bedstraw in field trials in New York and Pennsylvania (Curran 2007). The active ingredient is aminopyralid, which has a relatively low toxicity level. Milestone at four ounces per acre and Forefront R&P at both one-and-a-half and two ounces per acre provided 96 to 99 percent control of bedstraw in trials at Penn State University in both spring and late-summer applications. However, as with Crossbow, these herbicides also will eliminate all desirable broadleaf forages such as clovers and alfalfa that you may have in your fields.

Read and follow all label restrictions with any herbicide that you use. Some of these products have grazing and/or

harvest restrictions following application.

Key Management Points

Manage your hayfield by testing the soil and keeping nutrients and pH at levels where grasses and legumes will thrive. Apply nutrients and lime as needed.

Keep bedstraw plants from flowering, setting, and spreading seed, no matter which additional control option you use. If you manage hayfields, try to get the haycrop mowed before bedstraw sets seeds. This will help control the spread, give the grasses a more competitive edge, and also provide you with a better-quality crop. Be aware of a second flowering and seed-production period in August!

Make sure to control the spread of seed. Mowers, balers, rakes, and tedders can carry substantial amounts of seed from infested fields to clean fields. Remove any source of seed from equipment when moving from field to field. Research is still inconclusive about the spread of bedstraw via manure applications.

Tillage and rotation is very effective in killing perennial crowns and new seedlings that may develop. Consider a weed-controlling cover crop such as buckwheat or sorghum-sudangrass hybrids as part of your reseeding regime. Remember that a new seeding will need optimum management to keep smooth bedstraw from reinvading the field.

If using an herbicide such as Crossbow, Milestone, or Forefront R&P, make sure you control the weed's seed rain during the season prior to application, and understand that all broadleaf plants, including desirable clovers or alfalfa, will also be killed. If you decide to use glyphosate to renovate a pasture and kill perennial crowns of bedstraw, controlling seed rain is also critically important. Glyphosate treatments are most effective in late-summer applications.

Since bedstraw is so invasive, a neighborhood approach may be necessary to slow down the spread of this weed.

A well-managed, fertilized hayfield with a dense stand of perennial forages will be a good defense against invasion by smooth bedstraw.

Supporting Data

These tables summarize the data collected from the 2004 and 2005 bedstraw control [research trials in Northport, Maine](#).

Table 1. Stem counts and mean total yield of forage and bedstraw (first year study)

Treatments	Bedstraw Stems (no. per 0.25 m ²)	Total Yield	Bedstraw	Forage
				(kg dry matter per 28 in X 20 ft)
Control	110 ^b	0.533 ^b	0.187 ^{a,b}	0.346 ^b
Nitrogen	127 ^b	0.845 ^a	0.220 ^a	0.625 ^a
Crossbow	0 ^a	0.636 ^b	0.001 ^c	0.635 ^a
Glyphosate/No-Till	215 ^c	0.428 ^c	0.121 ^b	0.307 ^b
Tillage Reseed	0 ^a	0.365 ^c	0 ^c	0.365 ^b
Note about data: treatment means with different superscripts are significantly different P<.05				

Table 2. Stem counts and mean total yield of forage and bedstraw (second year study)

Treatments	Bedstraw Stem Density, 5/23/06 (no. per m ²)	Forage Dry Biomass, 6/07/06	Bedstraw Dry Biomass, 6/07/06	Forage Dry Biomass, 7/26/06	Bedstraw Dry Biomass, 7/26/06
					(g per m ²)
Control	469 ^a	124.5 ^{a,b}	53.9 ^a	110.8 ^{a,b}	48.5 ^a
Burn	563 ^a	92.8 ^b	63.3 ^a	88.9 ^b	54.8 ^a
Crossbow	0 ^b	183.5 ^a	0 ^b	155.3 ^{a,b}	0 ^b
Nitrogen	508 ^a	210.4 ^a	61.2 ^a	176.7 ^a	67 ^a

Glyphosate/No-Till	11 ^b	81.9 ^b	0.9 ^b	135.7 ^{a,b}	0 ^b
Tillage Reseed	0 ^b	134.7 ^{a,b}	0 ^b	118.3 ^{a,b}	0 ^b
Note about data: treatment means with different superscripts are significantly different P<.05					

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Funding for this project was provided through a Partnership Grant from the Northeast Sustainable Agriculture Research and Education Program (NESARE ONE04-025).

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