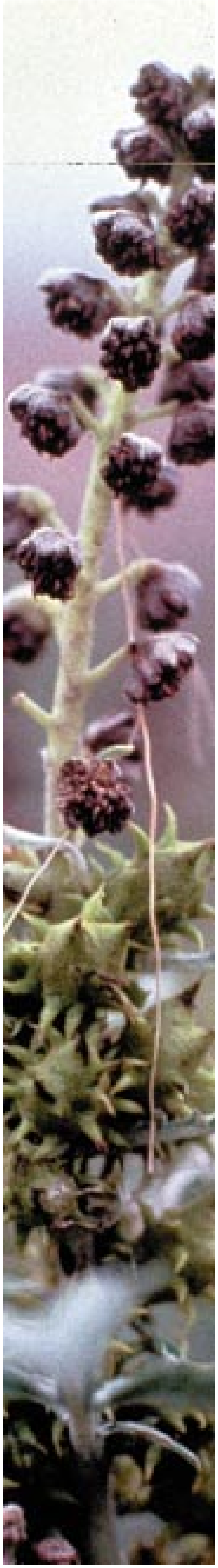


Woollyleaf Bursage

Biology and Control

Woollyleaf bursage, [*Ambrosia grayi* (A. Nels.) Shinners], also known as bur ragweed, is a perennial noxious weed native to Kansas. It is a member of the Composite family and was referred to previously as *Franceria tomentosa* in the false ragweed family. Taxonomists were not able to distinguish between *Ambrosia grayi* and *Franceria tomentosa* and thus the accepted current Latin name is *Ambrosia grayi*.

Woollyleaf bursage infests more than 80,000 acres in Kansas, primarily in the western half of the state. It is adapted to low areas where water runoff collects in cultivated fields or in non-cropland areas. The collection of water and the deep perennial root system, which can reach a depth of 15 feet, allow woollyleaf bursage to survive extended periods of drought or harsh weather. These circumstances make it very difficult to control. The development of irrigation may be extending the areas of adaptation beyond the immediate ponding areas, raising concerns that woollyleaf bursage acreage is expanding.

Woollyleaf bursage is extremely competitive with crops, and can reduce grain yield by 100 percent in dry years. Even with irrigation, losses of 40 to 75 percent are common (Finney County Noxious Weed Economic Impact). Woollyleaf bursage is more competitive with summer crops than with winter wheat because woollyleaf bursage growth is minimal during much of the winter wheat life cycle. However, in dry years, woollyleaf bursage will deplete soil moisture for fall planted wheat and thereby reduce grain yield significantly.

Woollyleaf bursage is one of the weeds classified as noxious within Kansas according to the Kansas Noxious Weed Law. This law requires that all noxious weeds be controlled. A copy of the Noxious weed law can be obtained from the Plant Health Division, Kansas Department of Agriculture, 901 S. Kansas, Topeka, KS 66612.

Biology and Growth Habit

Woollyleaf bursage is a deep rooted perennial. Root excavation showed that plants in a 4-year-old woollyleaf bursage stand had many roots penetrating the soil to a depth of 6 feet or more and measuring $^1/_8$ to $^1/_4$ inch in diameter. Several lateral roots branched from the tap root. The lateral roots were smaller in diameter and seldom developed below a soil depth of 10 inches. The average depth of lateral root development was 3 to 4 inches. Lateral roots were found as shallow as 0.25 inches.

New plants arise from the vegetative buds, which develop on the root stocks, thus contributing to the spread of woollyleaf bursage. Tillage also can redistribute vegetative buds, aiding the spread of woollyleaf bursage.

Shoots of woollyleaf bursage will grow from root buds, emerging during April. It has silvery-grayish foliage covered with dense white hairs, which gives the showy silvery-gray appearance. It has erect growth, 12 to 24 inches tall, and pinnately divided leaves with three to seven lobes.

During late July or early August, woollyleaf bursage flower development begins. A single flowering stalk may protrude from each stem. Inconspicuous, greenish-gray male flowers are borne on the tip and upper portion of the flowering branch. One to several greenish-gray female flowers are borne in the upper leaf axils, further down the stem than the male flowers. Where several female flowers develop in a leaf axil, clusters of burs develop.

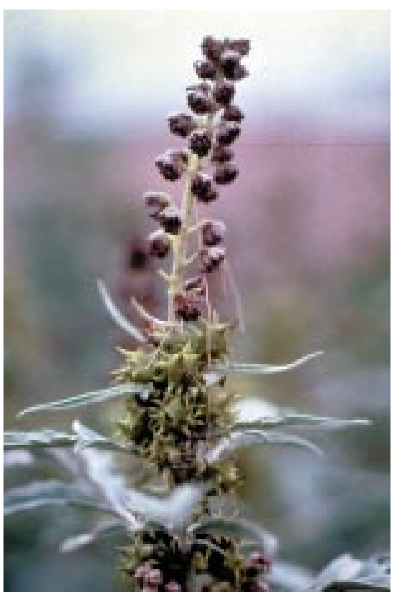
The fruits (burs), which arise from the female flowers, can be up to $^1/_3$ inch in length, are light-tan, and the hull is covered with sharp, hooked barbs. Inside the bur are two compartments that each potentially contain a seed. At Lubbock, Texas, a population

density of seven to 12 stems per square foot produced 380 to 460 burs per square foot.

In germination tests, seeds that remained encapsulated within the bur did not germinate regardless of exposure to a range of constant or alternating temperatures. Germination occurred only after the fruits were split and the seeds exposed to constant temperatures of 12°, 50°, 70°, or 80°F for 21 days and then exposed to fluctuating temperatures ranging from 12 to 85°F for 149 days. Sixteen percent germination occurred when unsplit burs were exposed to concentrated sulfuric acid for 60 minutes and constant 70°F temperature for 21 days. Seed contributes to the spread of woollyleaf bursage and likely is a source of new infestations.

Woollyleaf Bursage Control

Controlling woollyleaf bursage requires persistence and an integrated approach. Woollyleaf bursage spreads by roots and seed. Thus, it is important to minimize or prevent seed production. This can be acccomplished by using chemicals and tillage. Single tillage operations provide little long-term control of woollyleaf bursage. Nebraska reported that controlling woollyleaf bursage with tillage would require tillage 3 to 4 inches deep every 14 to 21 days for 2 to 3 years. Current residue requirements for cropland would not allow this excessive tillage needed to control woollyleaf bursage. When tilling the woollyleaf bursage infested areas, it is important to clean woollyleaf bursage roots from tillage equipment before tilling uninfested areas of the field or other fields to prevent its spread.



Effective chemical control of woollyleaf bursage requires systemic herbicides that will move with the carbohydrate reserves deep into the woollyleaf bursage root system. Herbicide treatment during the time when significant carbohydrate is being transported into the root system will provide the most effective control. However, treatments must be applied before a fall killing frost to allow herbicide uptake and translocation. Research at the Southwest Research-Extension Center in Garden City, Kansas suggests that herbicide applications should be made to woollyleaf bursage during the flowering stage (Table 1). Flowering will begin in late July or early August.

August applied treatments generally gave better control than treatments applied in September. Tordon tank mixed with Banvel or 2,4-D ester controlled woollyleaf bursage at both timings in both years when evaluated 9 months after treatment. However, control ratings 11 months after treatment were lower, indicating that some woollyleaf bursage had survived the herbicide treatment. The lower ratings 11 months

after treatment compared to 9 months after treatment held true for nearly all treatments. This stresses the importance of monitoring treated areas for regrowth for several months and perhaps 1 and 2 years after application to ensure that woollyleaf bursage is controlled.

Other herbicides provided some control of woollyleaf bursage, however, control was not consistent over timings and years. It is unlikely that a single herbicide treatment will eliminate woollyleaf bursage. One to several retreatments in subsequent years will be required for complete woollyleaf bursage control.

Control of woollyleaf bursage with August or September treatments can depend on available moisture and growing conditions. Stress from drought during these time periods is common with woollyleaf

Table 1. Woollyleaf bursage control 9 and 11 months after treatment with postemergence herbicides applied at flowering in mid-August or 30 days later in mid-September at Garden City, Kansas.

		Application timing[1]						
		1991		1995		AVG		
Treatment	Rate	Flwr	30 DAF	Flwr	30 DAF	Flwr	30 DAF	AVG
	(lbs/a)	(% control 9 months after treatment)						
Untreated	0	1	1	22	20	12	10	11
Stinger[2]	0.12	2	14	39	7	21	10	16
Stinger[2]	0.25	26	70	66	52	46	61	54
Starane[2] + Banvel	0.75+0.5	90	19	64	68	77	47	60
Starane[2] + 2, 4-D amine	0.25+1	96	14	65	32	80	23	51
Tordon + Banvel	0.25+0.5	98	99	100	100	99	99	99
Tordon + 2, 4-D LVE	0.25+1	100	94	100	100	100	97	99
Roundup + Banvel	1.5+1	45	44	74	52	59	48	53
Roundup + 2, 4-D LVE	1.5	96	9	68	30	82	20	51
LSD[3]=0.05		29		33		19		14

	(lbs/a)	(% control 11 months after treatment)						
Untreated	0	0	0	14	7	7	3	5
Stinger[2]	0.12	7	4	16	26	12	15	13
Stinger[2]	0.25	25	46	21	33	23	39	31
Starane[2] + Banvel	0.75+0.5	65	5	20	33	42	19	31
Starane[2] + 2, 4-D amine	0.25+1	85	11	41	3	63	7	35
Tordon + Banvel	0.25+0.5	77	85	69	99	73	82	77
Tordon + 2, 4-D LVE	0.25+1	98	79	89	69	93	74	84
Roundup + Banvel	1.5+1	34	24	28	9	31	16	24
Roundup + 2, 4-D LVE	1.5	75	24	13	30	44	27	36
LSD[3]=0.05		31		32		19		14

[1] Flwr = Flowering, mid-August; 30 DAF = Thirty days after first treatment, mid-September.

[2] Starane or Stinger were not registered for woollyleaf bursage control as of March 1997.

[3] LSD = Any two values differing by more than the LSD value found at the base of the columns are significantly different from one another.

Table 2. Herbicides for control of woollyleaf bursage.

Cropland

Herbicide and pounds active ingredient/acre	Formulated product/acre	Comments
Banvel 1 to 2	1 to 2 qt	Broadcast or spot treat to actively growing plants after crop harvest and before a killing frost. Treatment during or after flowering will increase control.
Banvel + 2,4-D 0.5 + 1	1 pt + 1 qt	Apply to regrowth in late summer or fall. For each pint of Banvel applied, delay wheat planting for 45 days after application.
Roundup Ultra + Banvel 0.38 to 0.75 + 0.5	1 to 2 qt + 1 pt	Apply with 2% v/v ammonium sulfate. Apply when plants are at or beyond the flowering stage and actively growing.
2,4-D LVE 2	2 qt	Apply during fallow period during active growth at the bud stage.
Tordon + 2,4-D 0.25 + 1	1 pt + 1 qt	Used in fallow when woollyleaf bursage is flowering, or in the fall. Allow 60 days following treatment before planting wheat. Do not plant susceptible broadleaf crops for at least 36 months.

Pasture, Rangeland, and noncropland

Any of the above treatments, with the exception that Roundup should not be used on pasture or rangeland.

Banvel 2 to 6	2 to 6 qt	For suppression and top-growth control. Can injure grasses.
Arsenal 0.5 to 1.5	2 to 6 pt	For use on noncropland areas only. Will control several other broadleaf and grass species. The addition of a nonionic surfactant at 0.5% v/v is recommended.

bursage. Herbicide effectiveness likely will be reduced when plants are severely stressed. In a study conducted in Seward County, Kansas during 1995, heavy rains fell after the drought stressed plants were treated in August. The study remained under water for at least 2 weeks. Nine months after treatment, no herbicide treatments provided any control of woollyleaf bursage. Drought and flooding can have an adverse affect on woollyleaf bursage control and can be a common occurrence in Kansas during August and September.

Herbicides registered for woollyleaf bursage control are Banvel, 2,4-D, Roundup, Tordon, and Arsenal (Table 2). Various combinations of these herbicides may be more effective than any one single herbicide applied alone. Read and follow label directions for herbicide use rates and plant back or grazing restrictions.

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