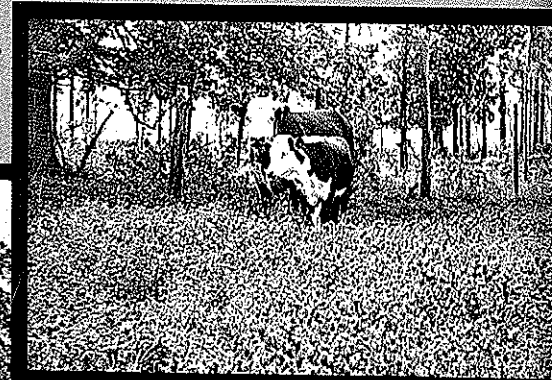


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# Pasture Weed Control in Mississippi



By  
Vance H. Watson  
and  
A. W. Cole

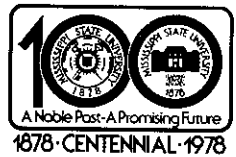


**MAFES** MISSISSIPPI AGRICULTURAL & FORESTRY EXPERIMENT STATION  
R. RODNEY FOIL, DIRECTOR MISSISSIPPI STATE, MS 39762

Mississippi State University

James D. McComas, President

Louis N. Wise, Vice President



*File Copy*

**Bulletin 872**

# **Pasture Weed Control in Mississippi**

**By**

**V. H. Watson, Agronomist  
MAFES Department of Agronomy**

**A. W. Cole, Weed Scientist  
MAFES Department of Plant Pathology and  
Weed Science**

**Mississippi Agricultural and Forestry Experiment Station  
Mississippi State University**

**August 1978**

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# Pasture Weed Control in Mississippi

Between 4 and 5 million acres are used for growing forage and pasture crops in Mississippi. The grasses and clovers grown on these acres vary widely in type, yield, and quality but all have one thing in common--little value until marketed through livestock.

Production and management practices used in the past 20 years have resulted in several-fold increases in forage and livestock production. However, it is estimated that only 20% of pasture acreage is maintained in improved grasses and legumes, only 10% is fertilized

properly, and less than 5% receives some form of weed control. The following guidelines were developed to show the types of weed problems present in Mississippi pastures and the impact they can have on forage and pasture systems.

## Types of Weed Damage

Most pastures have some weed pressure and the most obvious effect of weeds is a lower yield of desirable species, which in turn results in less efficient use of the land resource. Weeds also may harbor insects and disease organisms that attack desirable plants in the same or adjacent fields. Other less obvious effects of weeds are decreased forage quality, lower animal acceptability, slower curing time in hay production systems, and exposure of animals to toxic constituents. Carlisle (1978) found published evidence that 8 of 10 summer weeds in Mississippi contain one or more toxic compounds. Some of the more important compounds and their effects on livestock are presented in Table 1.

Production losses from weeds are much higher than is generally

recognized but are hard to assess because weeds are so common and widespread. Two practical approaches to weed control in forage and pasture systems are prevention and control. Klingman (1966) defines prevention as stopping a given species from contaminating an area. This is best accomplished by (1) making sure that new weed

seeds are not brought to the farm in contaminated crop seeds and feed, or by machinery and (2) preventing weeds on the farm from going to seed. Control is the process of limiting weed infestations and the amount of control usually is balanced between the costs involved and the amount of possible injury to the pasture or crop.

**Table 1. Toxic Compounds Found in Mississippi Weeds**

Compounds	Effect on Livestock
Nitrate	death
Soluble oxalates	death
Glycoside dugaldin	dehydration
Tremetol	dehydration-death
Resinoids	death
Glycoalkaloid solanine	death
Lysergic acid alkaloids	hallucination
Triterpenoid acids	death

## Weed Classification

Effective pasture weed control is obtained only when weed pop-

ulations are properly classified. Knowing the length of life of the

weeds, the time of year when they grow and their method of reproduc-

tion helps in determining the proper method to use for maximum control. Pasture weeds are classed as annuals, biennials, or perennials.

Annual plants complete their life cycle from seed to seed in less than one year. They are further classed

as summer annuals or winter annuals depending on the time of year when maximum growth occurs. For example, summer annuals germinate in the spring, make most of their growth in the summer and usually mature and die in the fall. A biennial plant lives

for more than one year but not over two years. Perennials live for more than two years and may live indefinitely. Reproduction is either by seed or from rootstocks. Perennials are often the most difficult group of pasture weeds to control.

## Methods of Weed Control

Methods of weed control normally are listed in one of six groups-- (1) mechanical, (2) chemical, (3) crop rotation, (4) crop competition, (5) biological, and (6) fire. The two most common methods used in Mississippi are mechanical and chemical. Mechanical control involves any type of implement, such as a mower, harrow, disk or cultivator. These tools either cut off, bury, or lift the weed from the soil. Mechanical weed control is effective on annual weed species.

Use of herbicides to control weeds in pastures has increased

rapidly in the last 20 years. The herbicides most commonly used in pasture weed control are classified as contact or systemic, depending on their effects on plants. Contact herbicides kill the plant parts covered by the chemical. There is little or no translocation or movement of this type of herbicide through living cells. In general, plants or plant parts treated with contact herbicides die soon after treatment. Contact herbicides are mainly effective against annual weeds and only defoliate the tops of perennial weeds. Systemic her-

bicides, in contrast, are absorbed either by the roots or above ground parts of plants and subsequently are moved throughout the plant. They are effective against annual, biennial or perennial plants. The full effects of systemic herbicides will not become apparent for several days after treatment.

Both contact and systemic herbicides also may be selective or non-selective. A selective herbicide kills or retards some plants with little or no injury to others. A non-selective herbicide is toxic to all plants.

## Time of Treatment

Chemicals usually are applied preplant, preemergence or post-emergence. Preplant treatment is

made before the crop is planted, preemergence is any treatment made before emergence of a specific

crop or weed, and postemergence treatment is made after emergence of a specified crop or weed.

## Types of Formulations

Herbicides rarely can be used as active ingredients alone, and inert ingredients are added to make handling and application safe, easy and accurate. The most common types of herbicide formulations available for pasture weed control are emulsifiable concentrates (EC or E), solutions (S), granules (G), and wettable powders (WP).

An emulsifiable concentrate can be mixed with water to form an emulsion. Each gallon of an EC usually contains 2 to 8 pounds of

active ingredient. Diluted EC's usually need some agitation to maintain the emulsion in the spray tank.

Solutions or high concentrates usually contain 8 or more pounds of active ingredient per gallon. They may contain only the active ingredient.

Granular formulations are dry. Most are made by applying a liquid formulation of the active ingredient to coarse particles of some porous material such as clay, corn cobs, or walnut shells. The amount

of active ingredient in a granular material usually ranges from 2 to 40%. Granules are used most often as soil treatments and are safer from a spray drift standpoint than EC's or solutions.

Wettable powders are dry, finely-ground formulations. They mix with water and usually contain 15 to 95% active ingredient. Wettable powders form a suspension rather than a true solution when added to water, and good agitation in the spray tank is needed to maintain the suspension.

## Application Equipment

Types of pasture sprayers used in Mississippi vary widely---ranging in type from those built in home shops to elaborate commercial models. Choice of equipment is extremely important to the success of a weed control program. The sprayer should be designed to do the job and should be durable and convenient to fill, operate and clean. Most pasture sprayers are low pressure units designed to deliver 10 to 40 gallons of water per acre at 15 to 50 pounds pressure. The advantages of this type sprayer are the use of medium to large tanks, low cost, light weight and versatility. Limitations are low gallonage output, low pressure limits and moderate agitation. Specific plans for various type sprayers are available from the Cooperative Extension Service in your county.

## Pasture Categories

Three categories of pastures generally can be identified in pasture weed control programs. They are (1) established perennial grass pastures with broadleaf and/or grassy weeds, (2) established grass-clover pastures with broadleaf and/or grassy weeds, and (3) newly planted grass, clover, or grass-clover pastures. Primary weed species found in each category are presented in Tables 2, 3 and 4.

The broadleaf weeds in category (1) can be easily controlled with herbicides now cleared for pastures. However, as use of clovers and other legumes becomes more widespread, the broadleaf weed problems in categories (2) and (3)

Herbicide research results are reviewed annually, and specific recommendations are published in the joint MAFES-MCES publica-

**Table 2. Primary broadleaf weed species in established grass and grass-legume pastures in Mississippi**

Common Name	Scientific Name
Redroot pigweed	<i>Amaranthus retroflexus</i>
Lambquarter	<i>Chenopodium album</i>
Common yarrow	<i>Achillea millefolium</i>
Common ragweed	<i>Ambrosia artemisiifolia</i>
Mayweed	<i>Anthemis cotula</i>
Horseweed	<i>Erigeron canadensis</i>
Bitter sneezeweed	<i>Helenium amarum</i>
Goldenrod	<i>Solidago sp.</i>
Woolly croton	<i>Croton capitatus</i>
Virginia copperleaf	<i>Acalypha virginica</i>
Curly dock	<i>Rumex crispus</i>
Buttercup	<i>Ranunculus sp.</i>
Blue vervain	<i>Verbena hastata</i>
Prickly sida	<i>Sida spinosa</i>
Horsenettle	<i>Solanum carolinense</i>
Smartweed	<i>Polygonum pensylvanicum</i>
Thistle	<i>Sonchus sp.</i>
Dogfennel	<i>Eupatorium capillifolium</i>
Onion-garlic complex	<i>Allium sp.</i>
Wild lettuce	<i>Lactuca scariola</i>
Dandelion	<i>Taraxacum officinale</i>
Annual fleabane	<i>Erigeron annuus</i>
Narrowleaf vetch	<i>Vicia angustifolia</i>

**Table 3. Primary grassy weed species in established grass and grass-legume pastures in Mississippi**

Common Name	Scientific Name
Broomsedge	<i>Andropogon virginicus</i>
Smutgrass	<i>Sporobolus poiretii</i>
Foxtail	<i>Setaria sp.</i>
Little barley	<i>Hordeum pusillum</i>
Goosegrass	<i>Eleusine indica</i>
Barnyardgrass	<i>Echinochloa crusgalli</i>
Broadleaf signalgrass	<i>Brachiaria platyphylla</i>

probably will increase.

With the exception of smutgrass, producers often treat the grassy weeds in categories (1) and (2) as grazable herbage and feel that a concerted effort to control specific

species with chemicals usually is not economical. The target species presented in Table 4 probably cause the greatest losses of new seedings.

## Chemical Programs Used in Mississippi

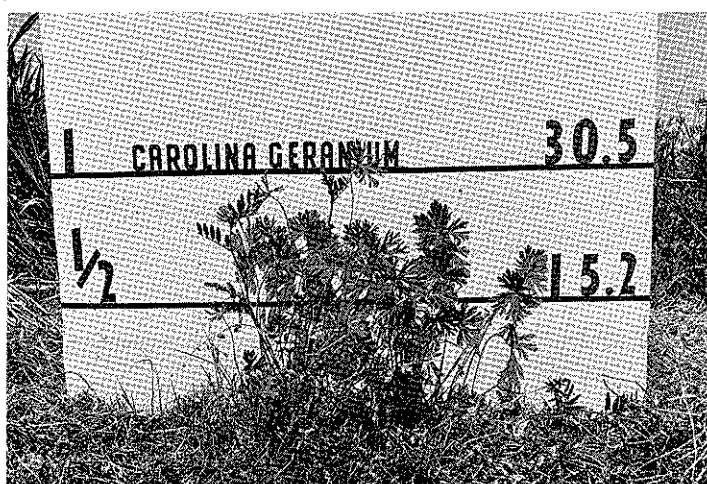
tion entitled **Weed Control Guidelines for Mississippi**. Recommendations for 1978 are presented in Table 5. **Caution:**

always read the label on the particular material you plan to use before making any herbicide application.

# Examples of Important Broadleaf Pasture Weeds in Mississippi

## horseweed<sup>1</sup>

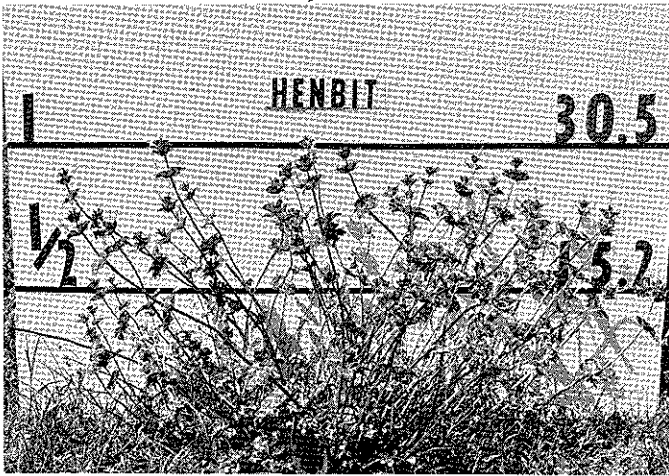
Annual. Short taproot, stems one to six feet tall, bushy branched in upper portion, rough-hairy. Numerous narrow, hairy leaves, alternate. Small flower heads with yellow centers. Found in peach orchards, old fields, fencerows.



## Carolina geranium

Winter annual or biennial. Smooth, erect, reddish stems, widely branching at base. Deeply cut leaves alternate or opposite. Compact flower clusters at tips of stems and branches. Small, pink flowers. Long, pointed seed pods. Found in lawns, gardens, pastures, cultivated fields.

<sup>1</sup>Weed descriptions taken directly from the publication entitled **Weeds of the Southern United States**, published by the Mississippi Cooperative Extension Service based on information prepared from a grant to the Georgia Cooperative Extension Service from the Federal Extension Service.

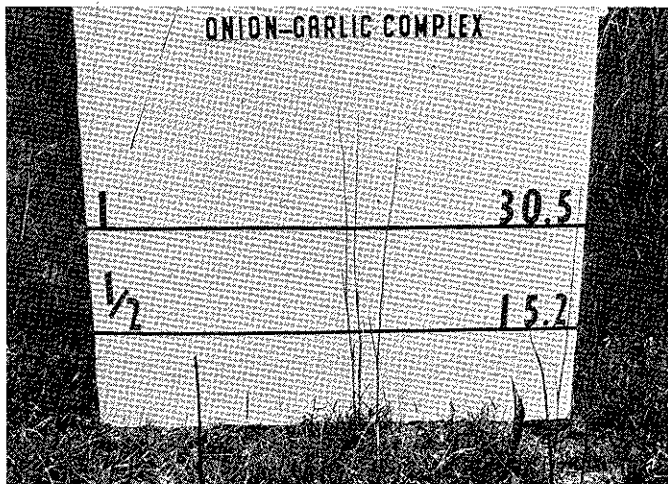
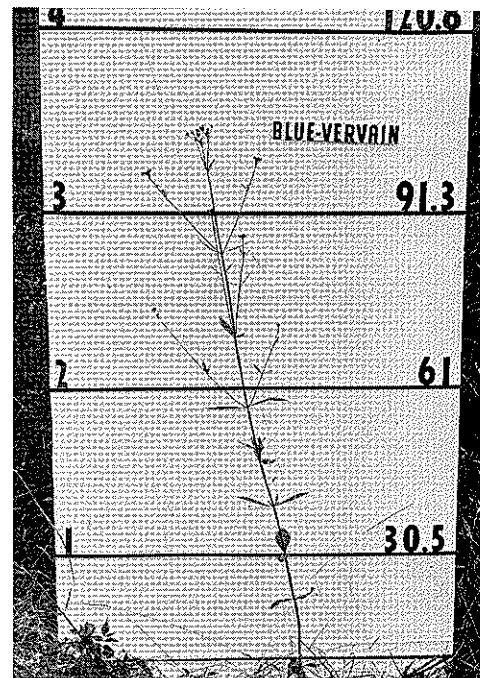


**henbit**

Winter annual. Stems square, four to six inches tall, nearly smooth. Slightly hairy leaves, rounded in outline, edges deeply scalloped, opposite. Purple or reddish-purple flowers borne at base of upper leaves. Found in grain fields, lawns, gardens, pastures, wastelands.

**blue vervain**

Summer annual. Stems four angled, rough, slender, branched. Leaves narrow, long, sparse, serrate. Flower spikes crowded, purple, small. Found in waste places, fencerows, pastures, roadsides.



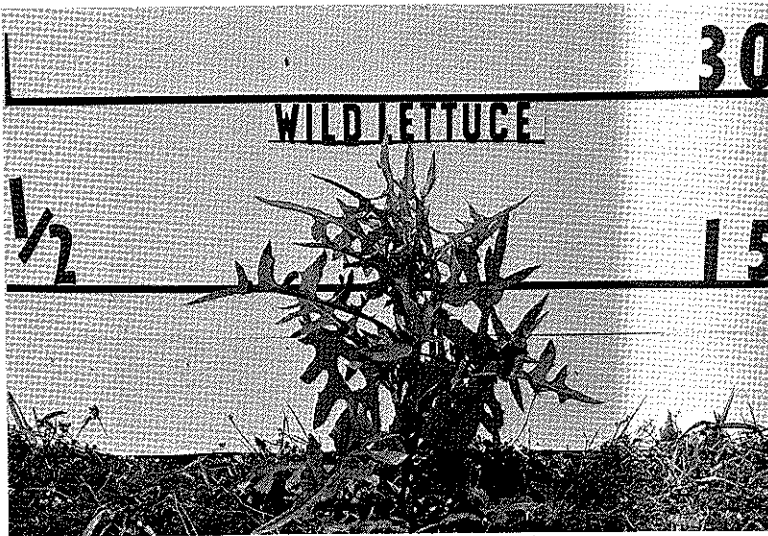
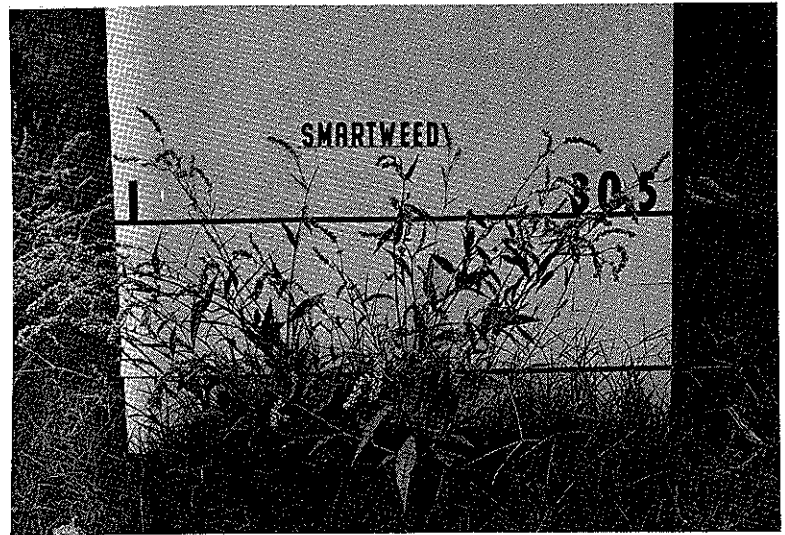
**onion-garlic complex**

Perennial. Stem with two to three hollow, round leaves from base of plant. Plant develops from basal bulb, covered with a thin, whitish, papery coat. At maturity, the bulb is covered with small, yellowish bulbs which readily split apart. Flowers are greenish-pink to purplish, often among small, greenish, aerial bulblets. Found in lawns, fencerows, pastures, small grain.



### **Pennsylvania smartweed**

Summer annual. Stems smooth, swollen at nodes, branching, one to four feet tall. Leaves smooth, pointed, alternate, with sheath at base surrounding stem. Flowers pink or rose, on short spike. Seed smooth, shiny black. Found in cultivated fields, ditches, wastelands.

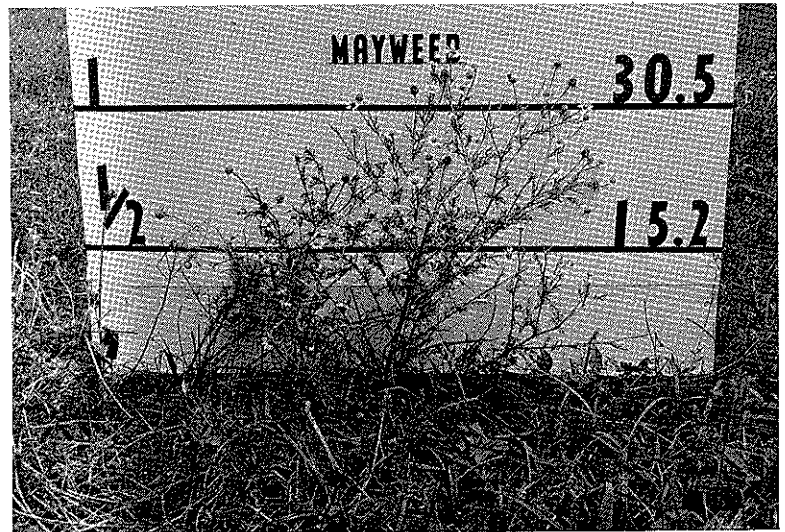


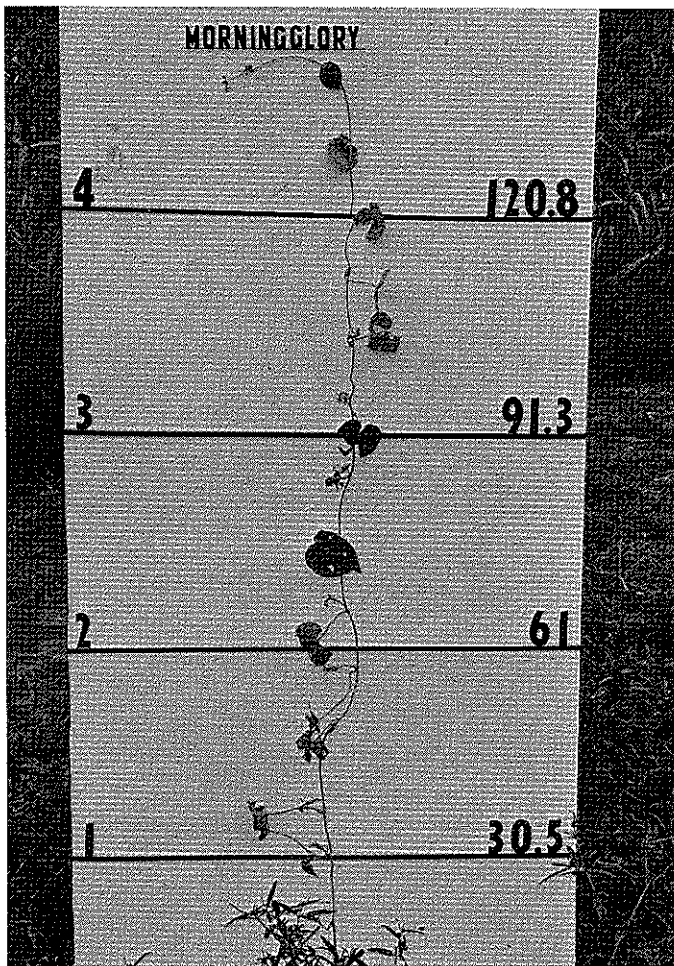
### **wild lettuce**

Winter annual. Long, fleshy taproot, erect stems two to five feet tall, branched in upper portion. Milky juice. Leaves often turning to vertical position. Leaves alternate, edges deeply cut to form lobes with spiny or toothed edges. Mid-vein prickly beneath. Flower heads small with yellow petals. Found in cultivated fields, wasteland and roadsides.

### **mayweed**

Winter annual. Erect stems much branched, 1/2 to two feet tall, nearly smooth. Leaves finely cut, hairy, alternate, strong, unpleasant odor when crushed. Flower heads like a small daisy, center yellow, encircled by white petals. Found in unimproved pastures, old fields, waste places.



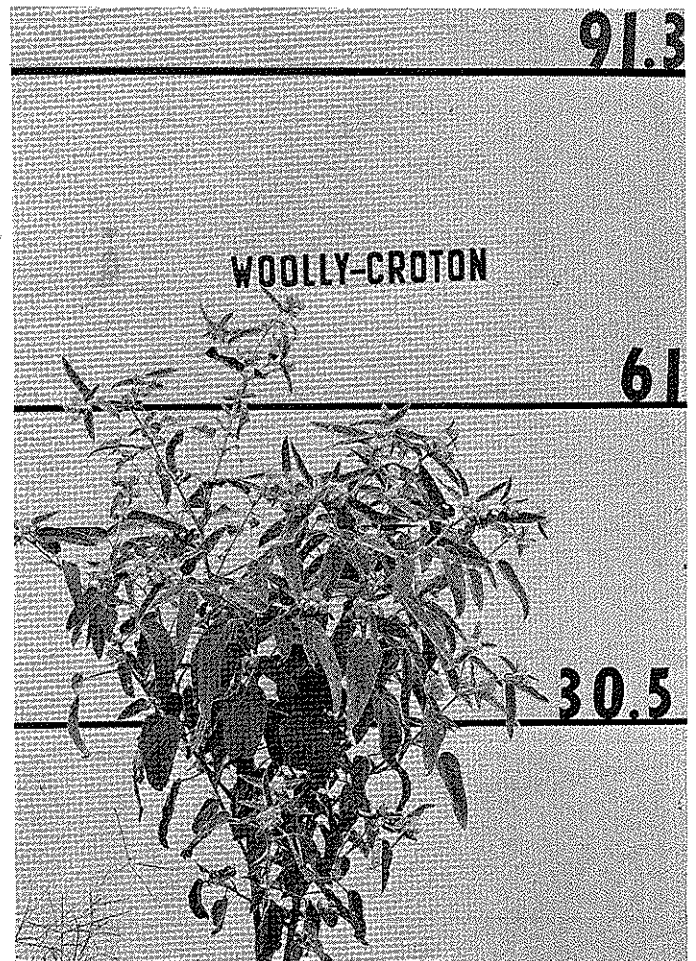


**morningglory**

Annual. Trailing or twining, hairy stems. Alternate leaves broad, heart-shaped. Funnel-like flowers in clusters of three to five. Flowers red, purple, blue or white. Seed brown to black. Found in cultivated and abandoned fields.

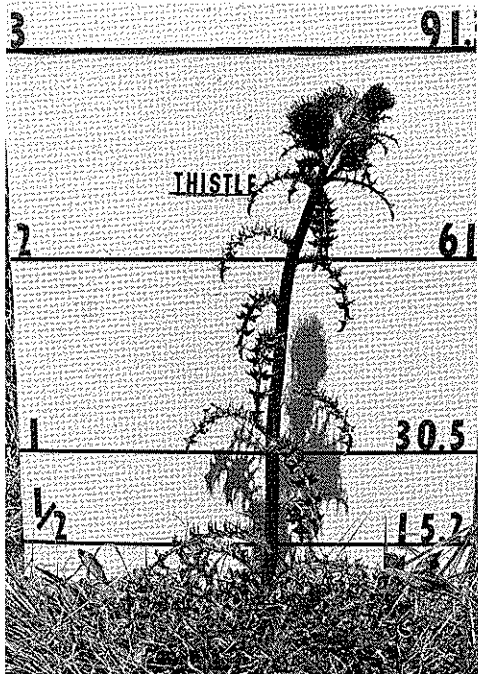
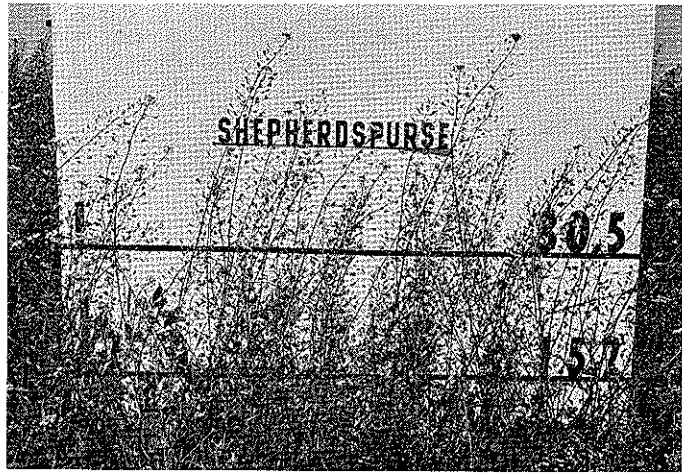
**woolly croton**

Summer annual. Stems one to three feet tall, branched. Leaves alternate, narrow, on long stalks. Stems and leaves densely hairy, grayish-green in color. Flowers in tight clusters at ends of branches. Seed pod densely hairy, three-lobed, with three seed. Found in cultivated and abandoned fields.



### shepherdspurse

Winter annual. Smooth, branched stem with few leaves, from basal rosette of leaves. Stems erect, ½ to 1½ feet tall. Flowers small, four-petaled, in elongated racemes at branch ends. Seed pods angularly heart-shaped, with two parts. Seed many, yellowish. Found in cultivated and abandoned fields.

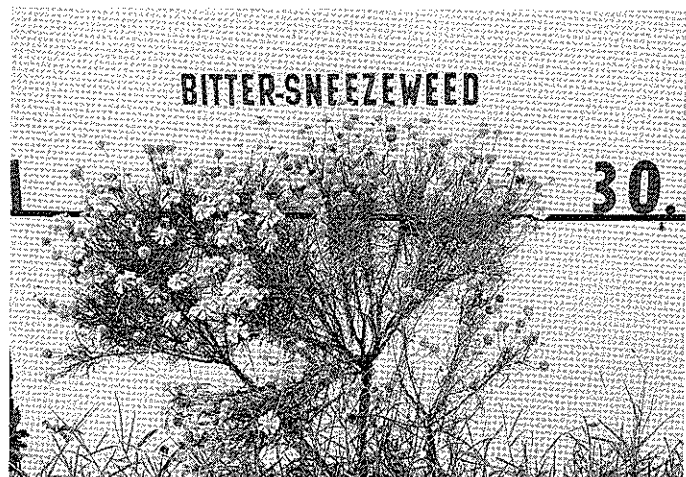


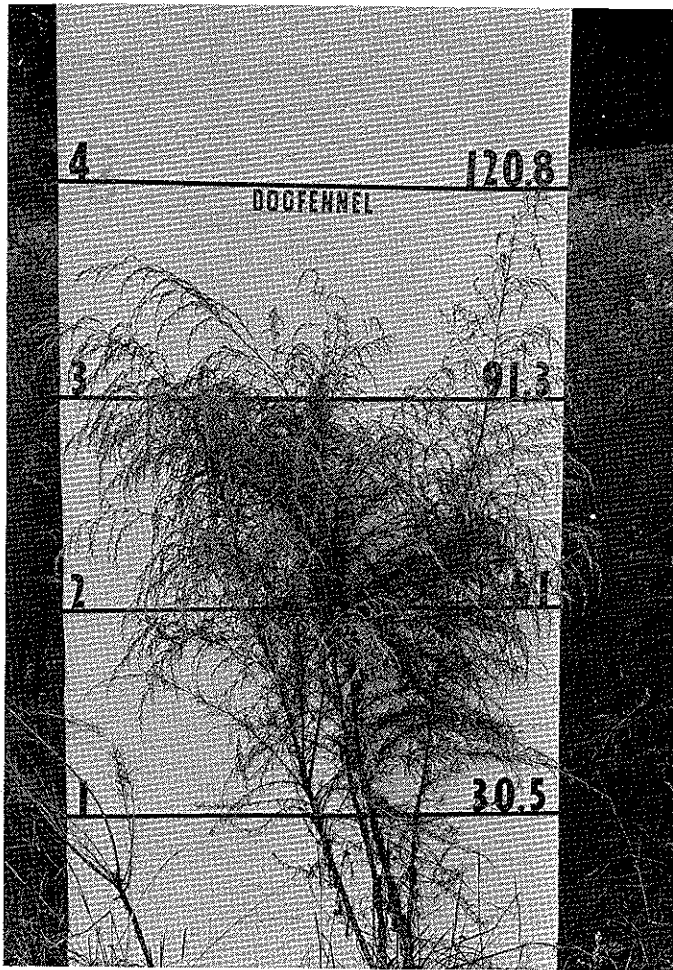
### thistle

Winter annual. Stem smooth, green or purple, branched. Leaves mostly entire, prickly-edged, clasping stem with pointed to rounded lobes. Flower heads small, yellow, on numerous branches. Found in gardens, pastures, roadsides, abandoned fields.

### bitter sneezeweed

Summer annual. Stems 4 to 24 inches tall, purplish color, branching. Leaves small, thread-like, numerous. Flower heads yellow, center dome-like. Plants with pungent odor. Bitter taste, imparting undesirable odors or flavors to dairy products. Found in wastelands, unimproved pastures.



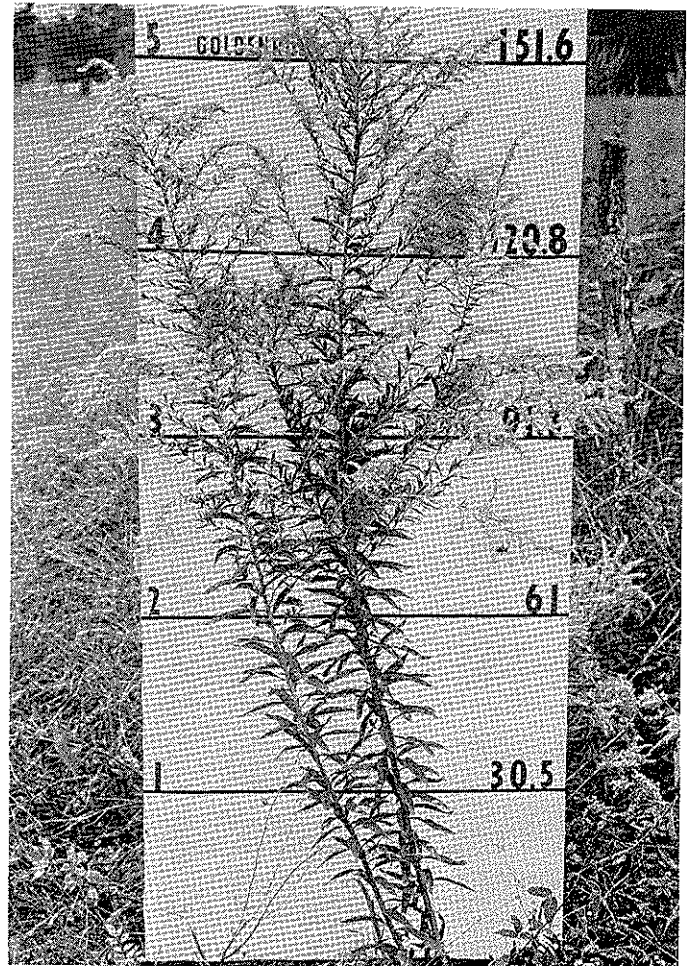


### dogfennel

Perennial. Shallow taproot, multiple reddish-purple stems three to nine feet tall, branching near top. Leaves divided into several thread-like segments. Numerous tiny, white flowers developing extremely small seed tipped with feathery crowns. Found in unimproved pastures and old fields.

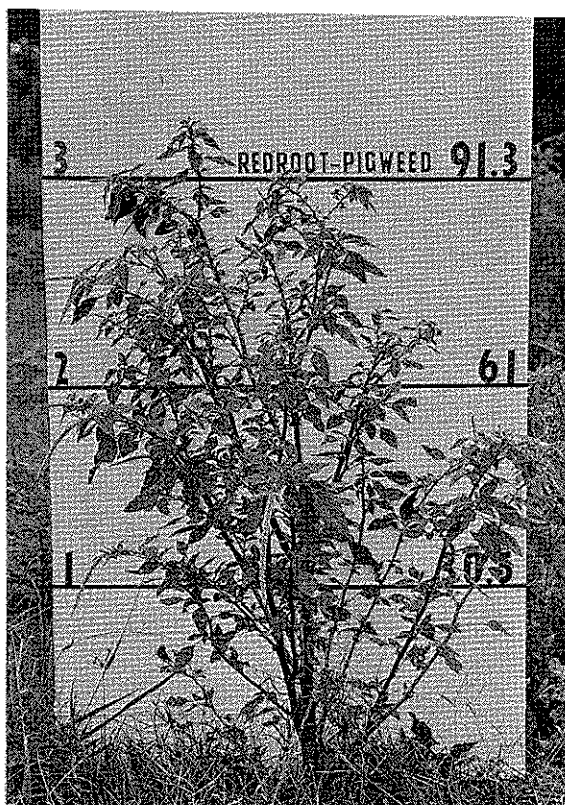
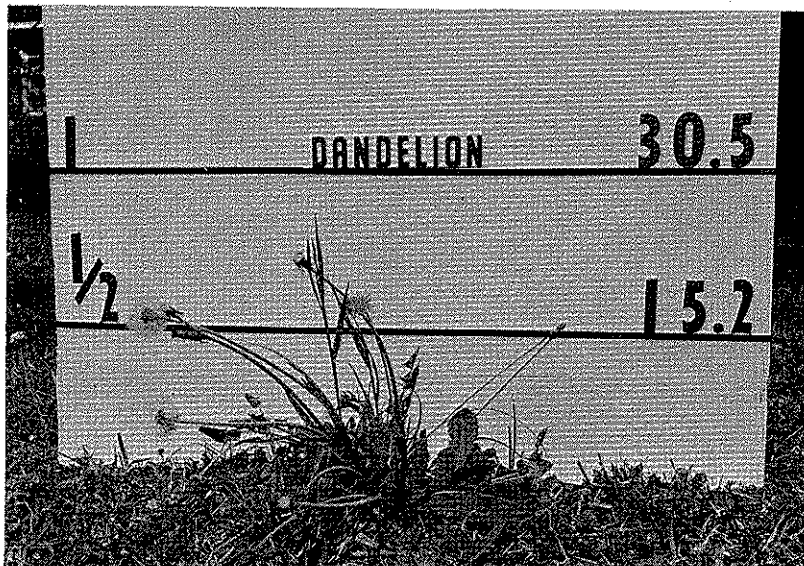
### goldenrod

Perennial. Stems  $\frac{1}{2}$  foot to four feet tall, hairy, grayish-green. Basal leaves tongue-shaped, upper leaves smaller. Flower heads small, clustered on slender, curving branches two to eight inches long. Found in old fields, fencerows and open woods.



### **dandelion**

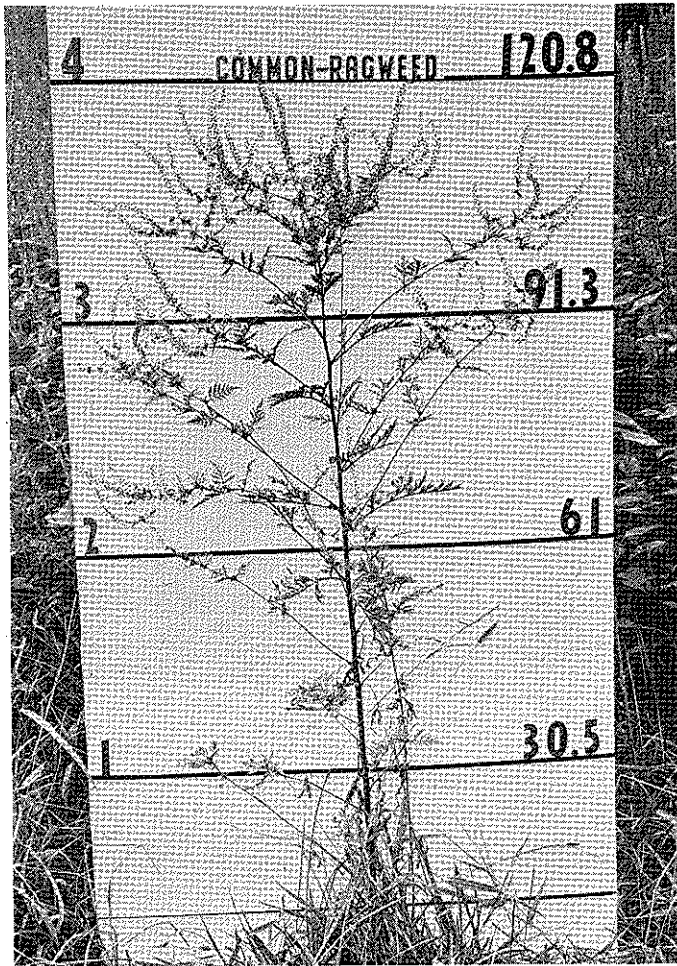
Perennial. Root thick, fleshy. No stem. Leaves in rosette from crown, simple, variously lobed, milky juice. Yellow flowers, heads borne on long, bare, hollow stalk. Seed elongate, tipped with tuft of hairs. Found in lawns, pastures, gardens, waste areas.



### **redroot pigweed**

Summer annual. Stems erect, to six feet tall, rough textured, freely branching. Dull green leaves, long petioles. Small, green flowers in dense spikes in upper leaf axils and stem ends, with three spiny bracts around each flower. Shiny black, tiny seed. Found in cultivated fields, barnyards, fencerows and waste areas.

Smooth pigweed (*A. hybridus*) is similar but petioles shorter, plant texture not rough, with fewer, less dense flower spikes.

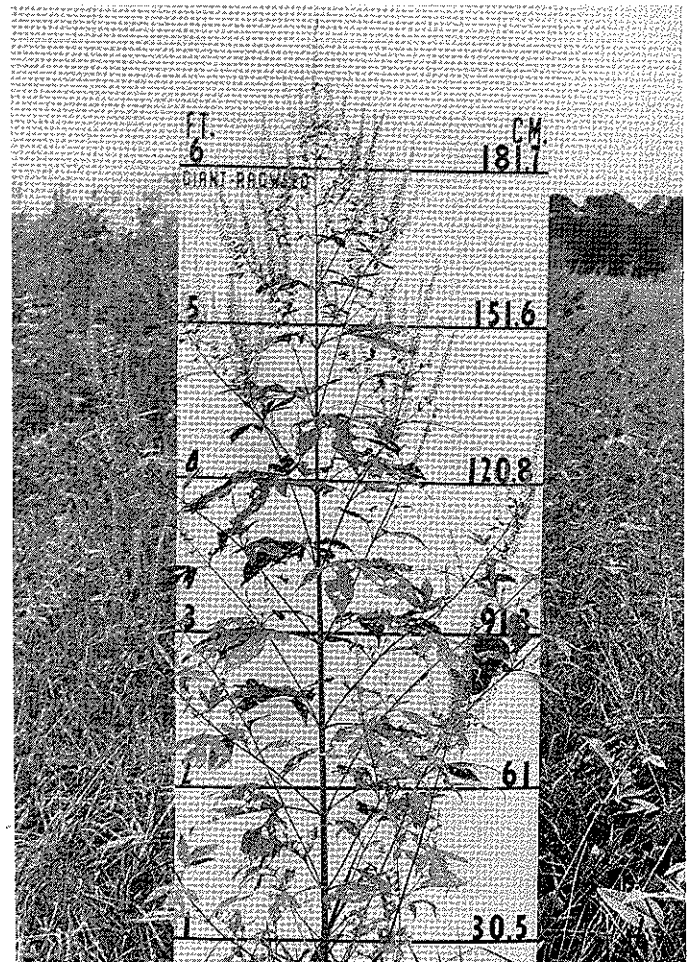


**common ragweed**

Summer annual. Erect, rough, hairy, purple, branching stems one to six feet tall. Smooth leaves deeply cut into several toothed portions, alternate. Flower heads of two kinds: 1—pollen-producing, small, inverted cups in slender clusters at tips of branches. 2—seed heads borne at leaf bases and forks of upper branches. A common weed found in all croplands.

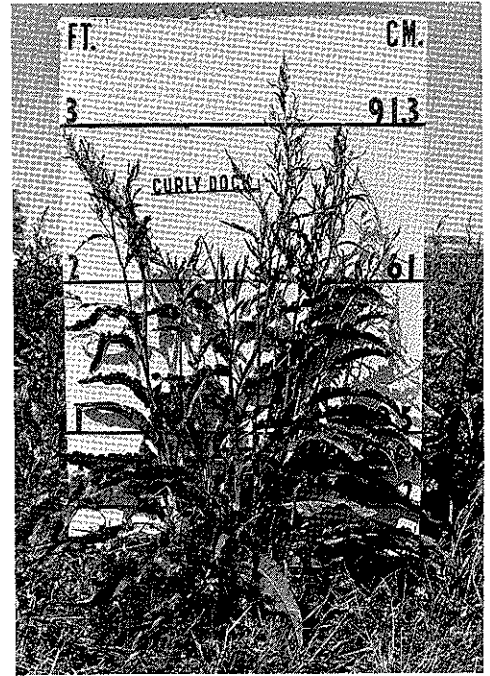
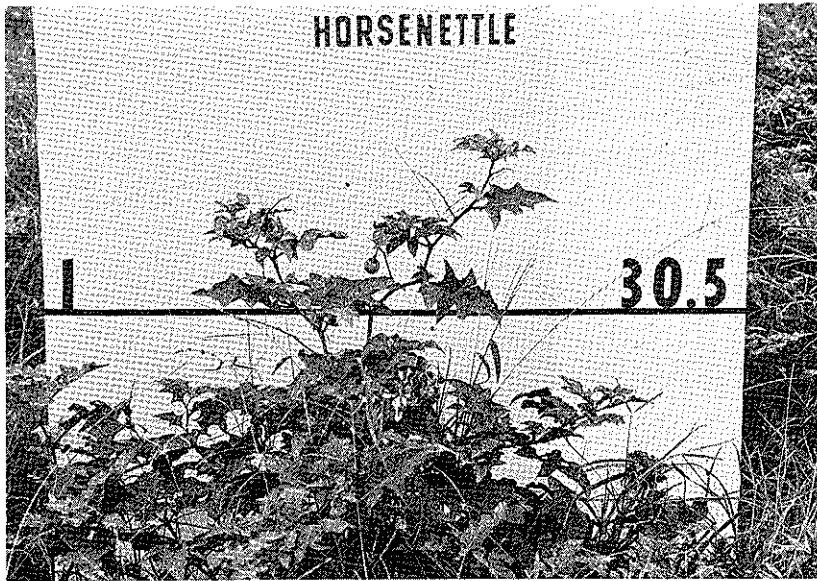
**giant ragweed**

Summer annual. Stems 6 to 12 feet tall. Leaves large, three- to five-lobed, in pairs at the stem joints. Similar to other ragweeds in flower, fruit and habitat.



### horsenettle

Perennial. Extensive, deep, creeping rootstocks. Stems single or branched, one to two feet tall. Leaves alternate, wavy edges or lobed, with yellow spines on leaf mid-ribs, veins and stems. Purplish or white flowers in clusters from stem ends. Smooth, large, yellowish-orange berries. Found in cultivated fields and wastelands, pastures, roadsides.

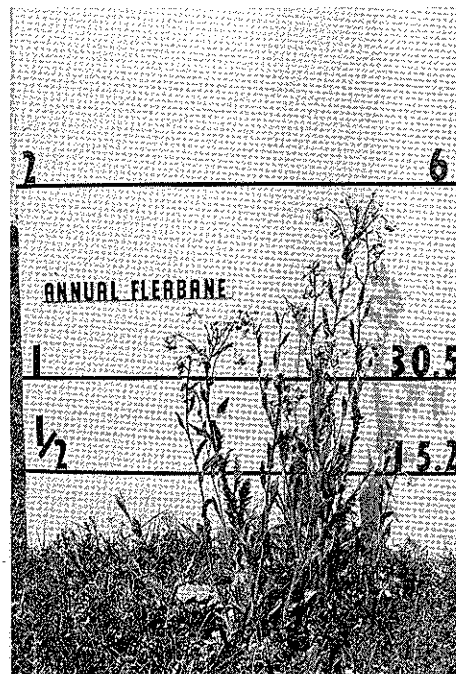


### curly dock

Perennial. Large, yellow taproot. Stems smooth, erect, one to four feet tall, one or more from root crown. Leaves mostly basal, lance-shaped, with wavy-curly edges. Flowers in dense clusters at stem tip, green, becoming reddish-brown. Seed shiny black, triangular. Found in pastures, roadsides, wastelands.

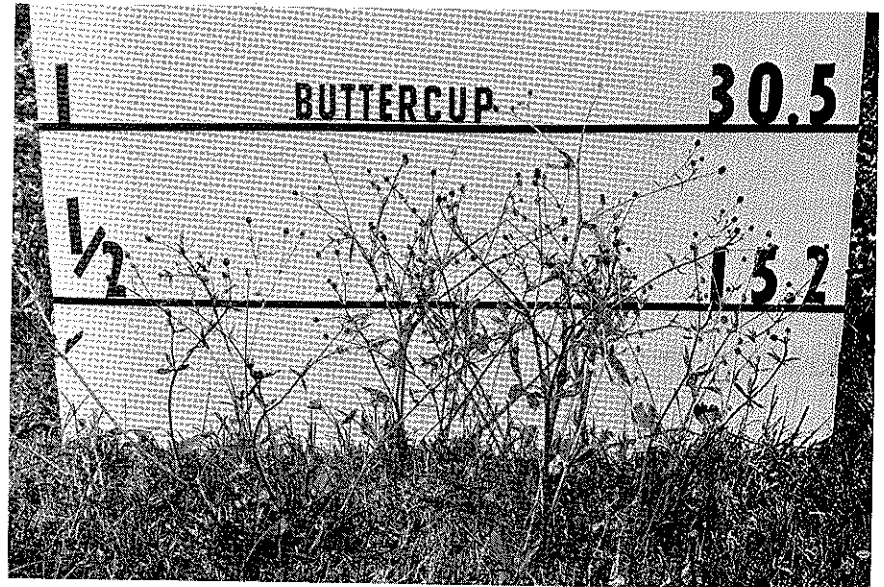
### annual fleabane

Summer annual or biennial. Stems one to two feet tall, branching near top. Leaves mostly at stem base, upper leaves smaller. Flower head single at branch ends, disc flowers yellow, encircled with white to light purple petals. Found in old fields and waste places.



**buttercup**

Winter annual. Stems slender, branched from base. Lower leaves round, bright green, on long petioles. Upper leaves on short petioles, divided into leaflets. Flowers small, yellow. Seed on round heads, flattened, with curved or hooked beak. Poisonous, acrid. Found in lowland pastures.



**narrowleaf vetch**

Winter annual. Vines or stems smooth, weak, with tendrils at leaf tips. Leaves compound with 8 to 12 leaflets. Flowers purple, with 4 to 12 flowers per raceme. Pods smooth, seed olive to brownish-black. Found in fields and wastelands.



## Value of a Sound Pasture Weed Control Program

Our approach to pasture weed control research has been based on evidence that (1) all pasture acreage has some degree of weed pressure and (2) it takes as much or more fertilizer to grow a pound of weeds as a like amount of desirable forage. Three common pasture weeds--pigweed, smartweed and ragweed--have been shown to accumulate 2.0 times as much nitrogen, 1.6 times as much phosphorus and 3.5 times as much potassium as does a desirable forage plant such as corn.

Trials to determine the value of weed control in a typical pasture situation were initiated in 1975 on weed-infested bahiagrass in Jefferson and Pearl River Counties. Heavy pressures of 2,4-D tolerant weeds existed--mainly dogfennel, smartweed, horsenettle and prickly sida. The Jefferson County experimental area had a heavier weed infestation and a thinner sod of bahiagrass than did the experimental area in Pearl River County.

Plots in each test were treated with per acre rates of 0.25 lb dicamba or 0.25 lb dicamba plus 0.75 lb 2,4-D. An untreated plot served as a check in each test area. No fertilizer was applied to the treated plots or the checks. Herbicides were applied broadcast in May and bahiagrass production was measured 75 days later.

The increase in bahiagrass production attributed to herbicide effectiveness (Table 6) ranged from 470% in Jefferson County (0.25 lb dicamba + 0.75 lb 2,4-D) to 698% in Pearl River County (0.25 lb dicamba). Value of the increased production at \$20 per ton of dry matter (the approximate cost of producing bahiagrass in 1976, not including harvesting cost) ranged from \$23.49 to \$44.08 per acre (Table 7). An example of the typical control

obtained in this experiment is shown in Figure 2.

Weed control reduced the lignin content of the bahiagrass to as

**Table 4. Primary broadleaf and grassy weed species in new seedings of grass, legume, or grass-legume pastures in Mississippi**

Common Name	Scientific Name
Carolina geranium	<i>Geranium carolinianum</i>
Sheperdspurse	<i>Capsella bursa-pastoris</i>
Virginia pepperweed	<i>Lepidium virginicum</i>
Morningglory	<i>Ipomoea sp.</i>
Chickweed	<i>Stellaria media</i>
Henbit	<i>Lamium amplexicaule</i>
Crabgrass	<i>Digitaria sanguinalis</i>
Crowfootgrass	<i>Dactyloctenium aegyptium</i>
Texas panicum	<i>Panicum texanum</i>



**Figure 1. It takes 80 lbs of high quality forage to produce a 1-pound beefsteak. Without effective weed control methods, the quality will be lower, it could take three times as much.**

Table 5. Chemical Weed Control Recommendations for Mississippi.

Pasture Weed Category	Situation	Active Chemical/A	Formulation Needed for 1 acre treated broadcast	Time of Application	Weeds Controlled	Special Instructions and Remarks
Established perennial grass pasture with broadleaf weed problem.	Pre-emergence	2,4-D at 1.0 to 2.0 lb/A	Broadcast: 2,4-D amine-1 to 2 qt in 10 to 20 gal water.	Before bitterweeds emerge; in late Feb. or March.	Bitterweed	Safe time to spray pastures next to cotton land or other susceptible crops.
	Post-emergence	2,4-D at 0.7 to 1.0 lb/A	2,4-D amine-0.66 to 1.0 qt in 10 to 20 gal water.	April to July.	Most broadleaf weeds.	Do not make treatments during long droughts. Do not apply to annual legumes until after seed production.
		dicamba at .25 to 1.0 lb/A.	Broadcast: .25 to 1.0 qt of Banvel in 20 to 40 gal water.	When weeds are actively growing.	Most broadleaf weeds and small brush.	Do not harvest seed for feed or food and do not graze meat animals in treated field within 30 days before slaughter. Do not graze dairy animals on treated areas within 7 days if 1/2 lb. is used or within 21 days if 1 lb. actual/A is applied. Dairy animals should not be fed dry hay from treated areas within 51 days after treatment.
		2,4-D at 0.75 lb/A + dicamba at 0.25 lb/A.	2,4-D at 0.75 qt and Banvel at 0.25 qt in 10 to 20 gal water per acre.	When weeds are actively growing.	Most broadleaf weeds and some hard to control ones, such as dogfennel, horse-nettle and cypress-weed.	Same precautions as for dicamba alone.
Established perennial grass pasture with a smutgrass problem.		dalapon 3.40 to 4.25 lb/A.	Dowpon M-4 to 5 lbs in 20 gal. water.	When smutgrass is actively growing (8-10 in. tall).	Smutgrass and most annual grasses.	Apply to tall actively growing smutgrass. Do not mow within 3 to 4 weeks before application. Best control with least reduction in grazing occurs when application is made well in advance of first frost; generally between Sept. 15 and Oct. 15. Mow 2 weeks following application and if desired overseed winter grazing crops. Do not graze lactating dairy animals or slaughter beef animals within 6 weeks after application.
Established bermudagrass pasture with annual weed problem		paraquat at 0.25 lb/A.	1.0 pt of Paraquat CL in 20 to 30 gal water.	Mid-March	Emerged annual broadleaf and grassy weeds.	Add 1.0 qt of non-ionic surfactant per 100 gals of spray solution. Do not graze or mow for hay until 40 days after treatment.
Established grass-clover pastures with broadleaf weed problem.		2,4-DB at 0.5 to 1.0 lb/A.	Broadcast: 2,4-DB, 1.75 lb material, at 1-2 qts/A in 10 to 20 gal water.	When broadleaf weeds are actively growing.	Most broadleaf weeds.	Apply before weeds are 3 inches in height. Do not graze or cut hay within 30 days after treatment.
New plantings of hybrid bermudagrass.		simazine 2 to 3.2 lb/A	Broadcast: Simazine 80W-2.5 to 4 lb/A.	After bermuda is sprigged and before weeds emerge.	Most annuals and some seedling perennials.	Use higher rates on heavier soils-light rate on sandy soils.
		2,4-D at 2 lb/A.	Broadcast: 2,4-D amine-2 qts in 10 to 40 gal water.	After bermuda is sprigged and before weeds emerge.	Most annuals and some seedling perennials.	Follow precautions on label.

**Table 6. Influence of Chemical Weed Control on Bahiagrass Production.**

Location	Rate Lbs (a.i.)/A	Chemical	Broadleaf	Bahiagrass Dry Matter Yield	
			weeds after 75 days	Total	% of Check
Jefferson Co.		None	92.0	635	--
	0.25	dicamba	0.0	3005	473
	0.25 + 0.75	dicamba + 2,4-D	0.0	2984	470
Pearl River Co.		None	79.4	748	--
	0.25	dicamba	0.0	5156	698
	0.25 + 0.75	dicamba + 2,4-D	2.0	4703	628

**Table 7. Value of Weed Control in Bahiagrass**

Location	Rate Lbs (a.i.)/A	Chemical	Bahiagrass Dry Matter Yield Lbs/A	Per Acre Values as Hay	
				Total	Increase Attributable to Spraying
Jefferson Co.		None	635	6.35	--
	0.25	dicamba	3005	30.05	\$23.70
	0.25 + 0.75	dicamba + 2,4-D	2984	29.84	\$23.49
Pearl River Co.		none	748	7.48	--
	0.25	dicamba	5156	51.56	\$44.08
	0.25 + 0.75	dicamba + 2,4-D	4703	47.03	\$39.55

<sup>1</sup>Based on a value of \$20.00 per ton for unharvested forage.

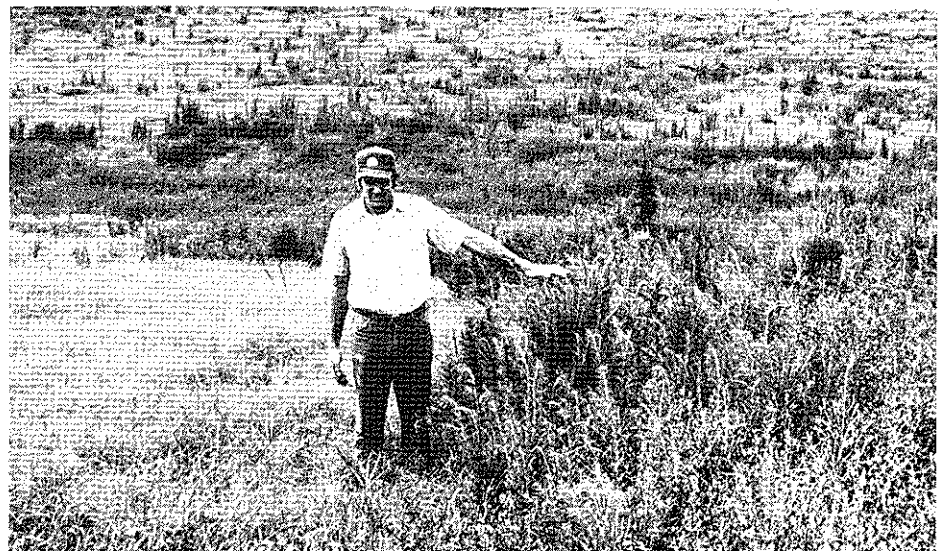
little as 5.9% (Table 8). Digestible dry matter increased from a low of 43.1% without weed control to as high as 58% with weed control. This increase in quality could be the difference in several pounds of digestible dry matter per ton of hay or grazing.

The percentage of crude protein in the bahiagrass was essentially the same for the check and treated plots (Table 9). However, if the increased production of desirable forage resulting from weed removal is considered, the increase in value of protein attributable to herbicide effectiveness ranged from \$38 to \$97 per acre (based on protein valued at 20¢ per pound, the approximate cost of a pound of protein from cottonseed meal).

In another experiment, a bermudagrass-dallisgrass pasture was treated with herbicides to

remove infestations of smutgrass. Estimated forage quality was im-

proved by controlling smutgrass (Table 10). Soluble cell content (SCC)---the highly digestible portion of the plant---and calculated



**Figure 2. Example of weed control obtained from a single application of dicamba left, check plot on right.**

**Table 8. Effect of Weed Control on the Forage Quality of Bahiagrass**

Location	Rate	Chemical	Lignin	Digestible
	Rate		Content	Dry Matter
	Lbs (a.i.)/A		-----%	
Jefferson Co.		None	13.2	43.1
	0.25	dicamba	6.8	50.8
	0.25 + 0.75	dicamba + 2,4-D	6.1	49.7
Pearl River Co.		none	9.2	48.5
	0.25	dicamba	5.9	58.0
	0.25 + 0.75	dicamba + 2,4-D	5.9	57.2

**Table 9. Effect of Weed Control on the Crude Protein Content of Bahiagrass forage**

Location	Rate	Chemical	Crude Protein <sup>1</sup>		Increase Attributed to Spraying	
			%	lbs/A		
	Lbs (a.i.)/A			\$		
Jefferson Co.		None	7.4	46.8	9.36	---
	0.25	dicamba	8.1	242.2	48.40	\$39.04
	0.25 + 0.75	dicamba + 2,4-D	7.9	235.1	47.02	\$37.66
Pearl River Co.		None	10.7	79.6	15.92	---
	0.25	dicamba	10.9	564.0	112.80	\$96.88
	0.25 + 0.75	dicamba + 2,4-D	10.4	491.0	98.18	\$82.26

<sup>1</sup>Yield calculated as D.M. yield x % crude protein

<sup>2</sup>Protein value assumed to be 20¢/lb., the approximate cost of a pound of protein from cottonseed meal.

nutritive value both were increased significantly with 83% or more smutgrass control. The increase in value of forage attributable to quality improvement alone was greater than the cost of attaining the 83% or more smutgrass control. We infer from the results of these experiments that increases in the quantity and quality of forage resulting from sound weed control programs will add more to the value of forage than the programs will cost in most instances. We plan additional trials for testing the validity of this inference.

**Table 10. Forage quality estimates of a bermudagrass-dallisgrass pasture as affected by control of smutgrass.**

Herbicide	Rate	Smutgrass	Soluble Cell	Nutritive
		Control	Contents	Value
	Lbs. (a.i.)/A	-----%		grams
None		0 c <sup>1</sup>	25.0 d	30.4 c <sup>2</sup>
Atrazine	4	88 a	28.3 c	33.9 bc
	8	97 a	32.4 ab	40.2 a
Bromacil	4	83 ab	29.4 bc	37.2 ab
	8	97 a	33.6 a	40.8 a

<sup>1</sup>Means within a column that are followed by the same letter are not significantly different at the .05 level of probability.

<sup>2</sup>Grams digestible dry matter per kg of body weight to the 0.75 power.

## Herbicide Safety and Handling<sup>2</sup>

Herbicides always should be handled to minimize the possibility of harm to nontarget organisms (including man), either through contamination of food and water or by contact. All spraymen should be given training in the proper handling of herbicides. Suggestions are:

1. Know the material being applied; READ THE CONTAINER LABEL AND UNDERSTAND THE DIRECTIONS for preparing and applying the herbicide, and then FOLLOW THE DIRECTIONS.
2. Wear protective clothing and avoid prolonged exposure to herbicides. Special care should be exercised to prevent inhalation and contamination of the skin when handling concentrates (use respirators, im-

- permeable aprons and gloves).
3. Avoid contamination of foods or drinking water of man and animals.
4. When herbicide contamination of the body occurs, wash the affected area quickly and thoroughly with soap and water. Wash with soap routinely after each day of spraying.
5. Keep spray equipment clean and in good condition. Flush equipment only where contamination will not affect man or wildlife.
6. STORE HERBICIDES IN PROPERLY LABELED CONTAINERS OUT OF REACH OF CHILDREN AND ANIMALS.
7. Dispose of empty containers safely (See Container Disposal Section.)

8. KNOW THE EMERGENCY MEASURES FOR TREATING ACCIDENTAL POISONING. When illness arises due to a possible overexposure to a herbicide, contact your local physician. Physicians and other medical authorities may obtain information on the toxicity of herbicides from the Poison Control Center, School of Pharmacy, University of Mississippi, University, Mississippi, Telephone number 234-1522.
9. If herbicides get into the eyes, flush the eyes with plenty of water for 5 minutes: Call a physician.
10. If a herbicide is swallowed, apply the first-aid treatment printed on the label of the container: Call a physician.

## Mixing and Handling Herbicides<sup>2</sup>

1. Mix and prepare herbicides in the open or in a well-ventilated place. When handled in close quarters, highly toxic herbicides may cause poisoning through inhalation. If the herbicides are volatile liquids, they may cause fires or explosions.
2. Open herbicide containers carefully to prevent billowing of dusts or splashing of liquids.
3. Pour herbicides carefully to avoid spilling.
4. Use special containers--drums or pails--for mixing herbicides; never use food or beverage containers.

5. Never use your mouth to siphon a herbicide from a container.
6. Do not mix herbicides in concentrations higher than those recommended. Measure accurately. These practices will help insure the application of correct and safe dosages.
7. Avoid spilling concentrates on the skin or clothes, and keep them away from the eyes, mouth, and nose. If any spills, wash it off with soap and water and change contaminated clothing immediately. Launder contaminated clothing before wearing it again. Launder

contaminated clothing separately. Do not launder with family wash.

8. Always wear rubber gloves when handling concentrates. Rinse the gloves with water before removing them; do not turn gloves inside out when removing.
9. To safely mix and prepare some herbicides, it is necessary to wear a respiratory device and protective clothing. The container label will tell if these precautions are needed.
10. Do not smoke, eat, or drink when mixing herbicides.

## Applying Herbicides<sup>2</sup>

1. If the container label prescribes it, wear a respiratory device

and protective clothing when applying a herbicide.

2. Do not apply dosages greater than those recommended on

<sup>2</sup>The following guidelines were developed by the members of the Mississippi Weed Science Committee and presented in the Weed Control Guidelines for Mississippi.

the container label.

3. Time your applications to prevent illegal herbicide residues from remaining on food, feed, or forage crops; allow the prescribed number of days' interval between the last herbicide application and harvest or grazing.
4. Guard against drift of herbicides onto nearby crops, pastures, or grazing livestock, or onto streams, ponds, lakes or other fishbearing waters. Do not dust or spray on a windy day.
5. Guard against runoff of herbicides into sources of water supply. Do not apply herbicides near dug wells, cisterns, or any other water sources into which they may run or be washed by rain. Do not clean application equipment, dump unwanted herbicides, or dispose of empty containers near these places.
6. When applying spray or dust, work into the breeze or at a right-angle to it; thus the herbicide will be blown away from instead of onto you. If this is not practicable, wear a respirator.
7. Do not smoke, eat or drink while actually applying herbicides.
8. Be careful not to rub eyes or mouth with your hands during applications.
9. If you should feel ill while

applying herbicides, stop work at once and get medical attention.

10. At the end of a day's work, bathe and change all clothing. Launder the clothing before wearing it again. Launder contaminated clothing separately. Do not launder with family wash.
11. If your shoes are leather and have become heavily contaminated with herbicide that can be absorbed through the skin, do not wear them again; burn or bury them. It is impossible to efficiently decontaminate leather shoes. Rubber shoes may be washed with soap and water.

### Protect Wildlife and Domestic Animals<sup>2</sup>

Unnecessary injury to fish, birds, honey bees and mammals may result from:

1. Drift of herbicides to wooded areas occupied by wildlife; drift to land areas not intended for treatments; and drift to fish-bearing waters.
2. Runoff or washoff by rain from treated areas to fish-bearing water.
3. Applications made too often or in excessive dosages.

4. Applications of herbicides that have toxicities unnecessarily high for the required control.
5. Applications made at the wrong times.
6. Carelessness.

### Some Suggested Precautions<sup>2</sup>

1. Use the least toxic and least persistent herbicide that is effective for your purpose.
2. Guard against drift of herbicides to wooded areas inhabited by wildlife.
3. Prevent runoff of herbicides into fish-bearing waters.
4. Do not treat extensive areas of water in one operation; the

decaying vegetation that would result might deplete the oxygen content of the water to the point of causing fish kills.

## References

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