

The Control of Bitterweed (*Actinea odorata*) on Texas Ranges

OMER E. SPERRY

Department of Range and Forestry, Texas A & M College, College Station, Texas

MORE than sixty species of plants on Texas range lands have been proven poisonous to livestock. About twenty species are of major importance in specific areas and localities depending upon their abundance and development of growth. Poisoning usually occurs during seasons when range forage is scarce. Texas poisonous plants are chiefly native species which have increased in abundance and area with overgrazing of the ranges.

Bitterweed (*Actinea odorata* (DC) Kuntze) heads the list in importance and has been of concern in parts of Texas since the early nineteen twenties. Bitterweed poisoning of sheep was first recognized on the Edwards Plateau in 1922 and deductive evidence was directed to this weed in 1924 (1). Many sheep are still lost every year where bitterweed is abundant with a corresponding loss of wool clip and reduction in lamb crops.

The recognition of bitterweed and its increase in abundance and area paralleled the increased stocking rates on the range areas of West Texas. Bitterweed is an annual of the sunflower family which may in moist areas attain a height of about 2 feet. It has numerous ascending branches which terminate in small heads (Fig.1). A single plant may produce more than a hundred flower heads and each head consists of more than fifty flowers, each of which is a potential seed producer. A single vigorous plant may thus produce more than 5000 seeds during its growing season. The leaves are alternate, once to thrice parted into thread-

like segments which are not ridged and are glandular dotted throughout. A characteristic of the plant is its aromatic odor and its bitter taste.

AREA OF INFESTATION

Bitterweed has been located in almost every county of Texas west of the 99th meridian. Its range extends into western Oklahoma, eastern and southern New Mexico, southern Arizona, southeastern California, and northern Mexico (4, 6). The area of heaviest infestation covers about 15 counties of the western portion of the Edwards Plateau (Fig. 2).

Within the area of greatest infestation, floods have been responsible for much of the spread of bitterweed. Drainage areas, lake beds, draws, and flooded sites are the usual places of infestation. Perennial vegetation is often killed out in these sites by standing water or by overgrazing and trampling and the bitterweed takes over. It is also common along roadways, trails, bed grounds, headquarters, and watering places. Bitterweed has been rather recently introduced into new localities, especially in Southwest Texas by moving sheep from infested areas.

SHEEP LOSSES

Although bitterweed has been a problem since 1922, only a few actual loss figures have been recorded. Jones, Hill and Bond (7) reported up to 28 per cent losses for 1930 but most ranchmen like to mention past losses as "bad" and do not reveal exact loss records. In surveys

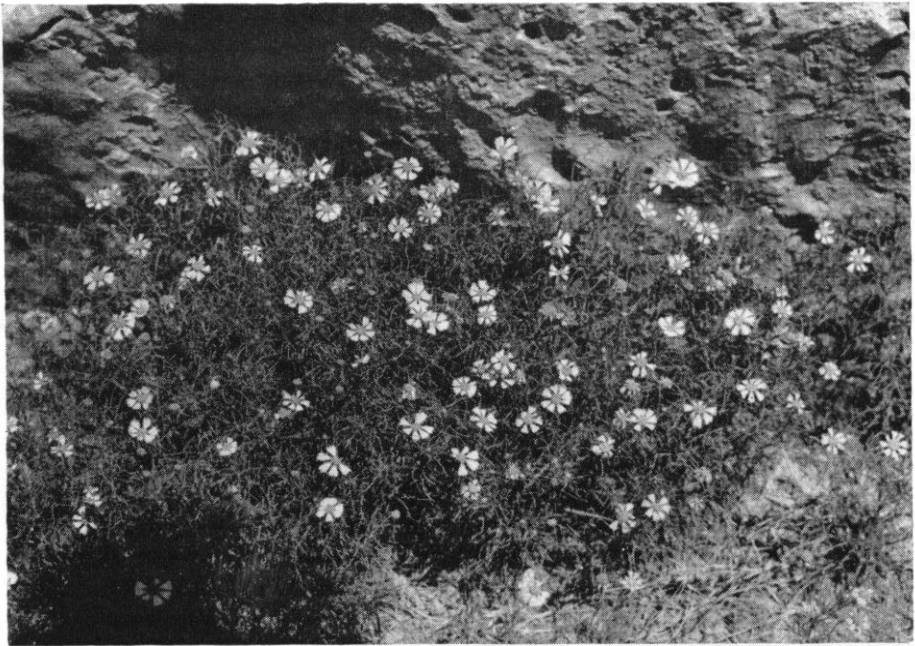


FIGURE 1. A SINGLE BITTERWEED PLANT GROWING IN A PROTECTED SITE IN SUTTON COUNTY, TEXAS

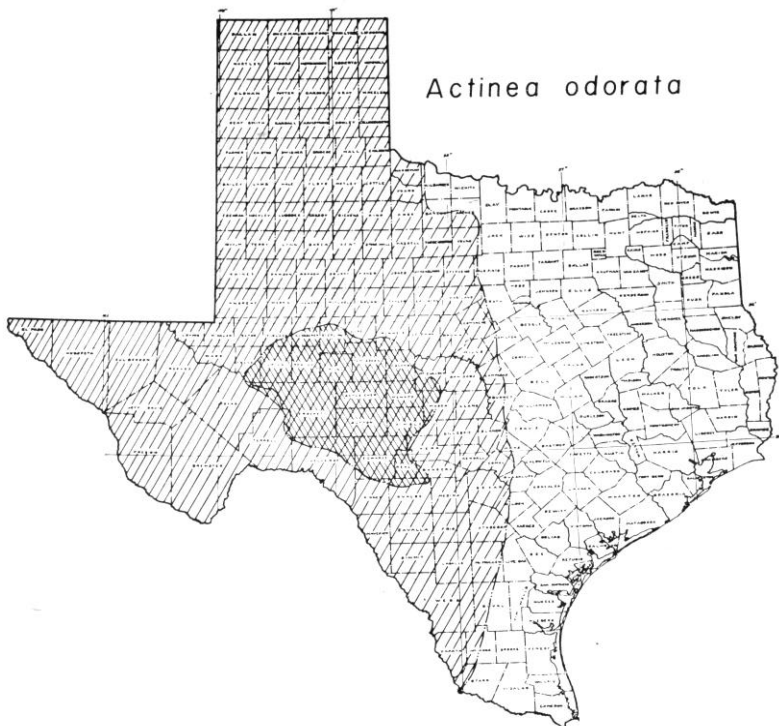


FIGURE 2. THE DISTRIBUTION OF BITTERWEED IN TEXAS

Scattered growth, collection records or localized infestation exist in the lightly hatched area. Severe poisoning and heavy losses occur within the heavily hatched area.

made in fifteen counties in 1948 losses from one or a few animals were common, losses from 10 to 25 per cent were frequent, and a few incidences of losses as great as 50 per cent, mostly from bitterweed, were recorded. Figure 3 shows several dead animals around water in a severely overgrazed bitterweed pasture. Over 400 sheep were lost on this ranch during the late spring and early summer of 1948.

ally a dark green discharge from the mouth and nose. A laggard gait and an arched back indicating abdominal pain are the early symptoms of chronic field poisoning. Ranchmen find the first symptoms usually become obvious 7 to 12 days after sheep are placed in bitterweed infested pastures. Some animals may become sick earlier while others may not show signs of poisoning for 30 or 60 days.

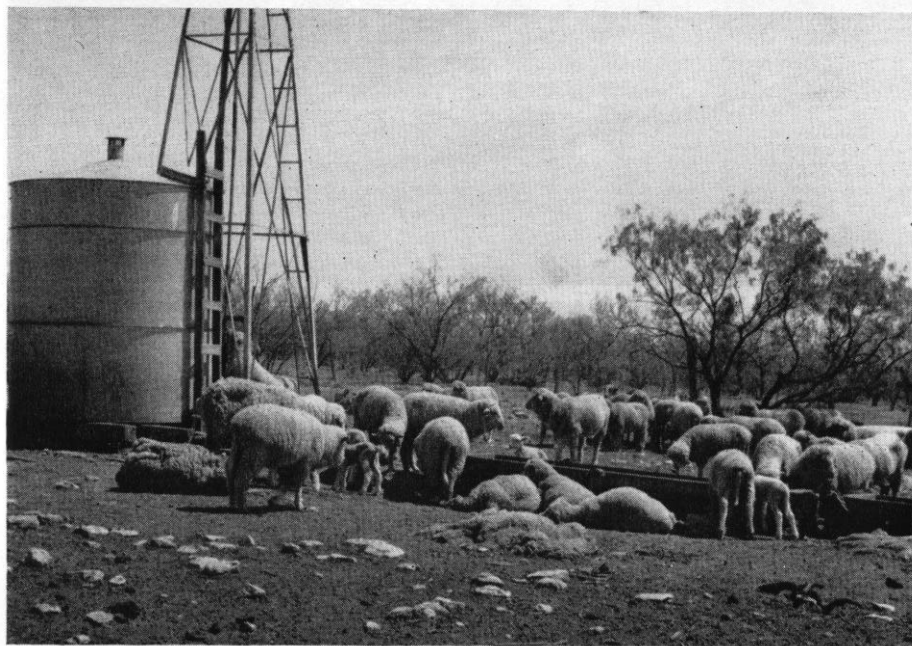


FIGURE 3. RESULTS OF BITTERWEED POISONING ON A SEVERELY OVERGRAZED RANCH IN TOM GREEN COUNTY, TEXAS

In early feeding tests (4, 6) young bitterweed plants amounting to 1.3 per cent of the animal's body weight, fed in large dose, produced acute symptoms in a single day. When bitterweed equaling 0.1 per cent of the body weight was fed daily, chronic symptoms were produced in 44 days. However, when 0.25 per cent was fed, the animals became extremely sick in 17 days.

The usual symptoms of illness are loss of appetite, weakness, depression, indications of abdominal pain, and occasion-

Lambs appear to be the first and ewes the last to show the poisoning symptoms.

Greatest losses in sheep from eating bitterweed usually occur in late winter and early spring before more palatable green vegetation becomes available. On areas receiving little or no rainfall during the late fall and winter, there are few winter weeds and consequently little bitterweed trouble. A big crop may follow late spring or summer rains resulting in sickness and heavy losses on ranges which are in a depleted condition. Such was

the case in 1948 when the heaviest losses occurred in April and May.

CONTROL MEASURES

Numerous methods have been used in the attempt to control bitterweed or to overcome the sickness which results from eating the plant. Some methods have proven to be of little value, others show some merit, but those incorporating good range management practices have given definite results.

Short range due to overgrazing and drought combined with bitterweed have forced many operators to sell their sheep in much of the bitterweed country. In one county for example, 60 per cent of the bitterweed infested ranches have been cleared of sheep in recent years and have been restocked with cattle, goats or both.

A precautionary measure that has been taken on several ranches is to fence off the worst bitterweed infestations and hand pull the remainder. On ranches where sites have been fenced 4 to 10 years, even in dry situations, perennial vegetation has completely crowded out the bitterweed.

An example of the ability of perennial vegetation to crowd out bitterweed was observed in two pastures, one of 400 acres and one of 10 sections, which had been rested for a period of 4 years. The reduction of bitterweed the first and second years was not noticeable but there was a marked improvement in the vigor of the grasses. During the third growing season the bitterweed showed a sharp decrease and, except for a few flooded and disturbed spots, all bitterweed had been crowded out by the perennial growth the fourth year.

All successful range management plans have involved reduction in the stocking rate or the introduction of deferred or rotational grazing practices. In order that deferment and rotation could be car-

ried out, most ranchmen have had to provide fencing to establish smaller pastures. In practice it has been found that small pastures, in which animals can be worked easily, are more adapted to a management program than large pastures in which animals can not be closely observed. Units of one to four sections are found to be the most workable.

On a 24-section ranch of 8 pastures and traps, a reduction in stocking and rotational-deferment grazing cleared the ranch of bitterweed in less than ten years. The better pastures were rested alternate growing seasons and the drier-upland units were given additional deferment. Some bitterweed seed washes on this ranch every year along a drainage area but plants that appear are hand pulled before they produce seed. The stock on this ranch are not only rotated in relation to available forage but the animals are segregated according to their relative nutritional needs. To begin the program, the operator reduced stocking from 200 sheep and 20 cattle per section to 100 sheep and 8 or 10 cattle per section. This rate was maintained or slightly reduced during low rainfall years. The dividends of this 10-year program were clearly shown in 1948 by a 108 per cent lamb crop in which it was estimated that the lambs would run 70 to 80 pounds. Adjacent ranches produced from 10 to 65 per cent lamb crops with most lambs running from 60 to 65 pounds.

Some operators feel that if they have sufficient pasture free of bitterweed to carry sheep through the poisoning period, they can continue their present methods of operation. One method of obtaining a weed-free pasture is to concentrate sheep in a unit for a week or 10 days during the winter when bitterweed plants are small. The animals are observed closely and removed when early symptoms of poisoning appear. After this brief but

intensive grazing period, all sheep are removed and placed on dry feed. With this procedure, bitterweed is reduced so that the unit can be used as a holding pasture while the weed is luxuriant in other pastures.

The quantity of bitterweed that sheep consume varies with the individual. Many operators in bitterweed territory watch their sheep closely and remove animals showing early signs of poisoning. These are confined and are given dry feed. If they eat they will usually recover. When general poisoning appears, all the animals should be removed from a pasture. Often times the movement of sheep from one pasture to another, even though both are infested, will give some relief. Supplemental feed of high protein content is thought to reduce poisoning. One manufacturer has prepared a special formula feed to be fed while animals are in bitterweed pastures to counteract the poisoning effects of the plant. Although the product is marketed without label, the manufacturer claimed it to be 43 per cent protein feed plus certain ingredients which are supposed to counteract the poisonous effects of bitterweed when it is eaten along with the feed. It is sold for fifty dollars a ton above market price of 40 per cent protein feed. Some operators give credit to the feed, others say it is of no value, but most ranchmen are too skeptical of it to give it any consideration.

Hand pulling is a common method of bitterweed control. The weed is pulled, sacked and burned. This method is usually applied around watering places, along draws and flooded areas, and on the margins of pastures adjacent to infested areas. Some ranchmen feel they have made progress where they have pulled consistently for several years in localized areas. One ranch of over 13,000 acres on which bitterweed had been pulled for 13 years was examined and found to

be free of bitterweed. The operator stated that he had spent \$25,000 pulling and felt that he was money ahead by so doing.

Much trial work and some widespread application has been made on the spraying of bitterweed with herbicides. 2,4-D has been used, both experimentally and with general field application. Experimental data obtained in 1948 on low rainfall, marginal areas of infestation with 2,4-D do not indicate satisfactory results. Growth was late and experimental spraying was delayed until May. The dry-hot weather which followed the spray treatments killed almost as many plants in the check areas as were dead in the treated plots. These results indicate that when the plants are in a somewhat dormant-wilted condition they do not absorb and translocate enough 2,4-D to bring about killing action. In another pasture in the 20-inch rainfall area, 10 sections were spot treated in 1947 at the rate of one pound of 2,4-D to the acre for two successive treatments two weeks apart. The few remaining plants were hand pulled the third time over a few weeks later. The total cost was \$35 per section but the bitterweed was cleared from the pasture for the balance of the year.

The largest overall bitterweed treatment known in the area was the power spraying of all infestation on a 28-section ranch. Approximately 1000 acres were treated at a cost of \$5,000 which included a power spray with a 30-foot boom; materials, and labor. The spray was applied at the rate of $1\frac{1}{4}$ pounds of 2,4-D in 42 gallons of water per acre. The operators concluded that, even though some hand pulling was included in their program, they obtained excellent results.

In one experiment 2,4-D was applied by airplane to vigorous growth of bitterweed in a wide draw at rates from $\frac{1}{2}$ to

1½ pounds of 2,4-D in one gallon of diesel oil per acre. 1.14 inches of rain fell on this area 24 hours after spraying. On one part of the treated area, water stood for several days and all plants covered by water were dead after the surface water disappeared 6 days later. On the well drained sites about a 50 percent kill resulted from the plane spray treatment.

Numerous additional treatments using 2,4-D on sites ranging from small hazard areas to entire pastures have been carried out. The overall kill of bitterweed with 2,4-D has been erratic. Poor results have been obtained on test plots with hand sprayers but results from recent plane spraying and jeep mounted turbine sprayer-duster work is encouraging.

The only permanent method of controlling bitterweed is to maintain a good cover of perennial vegetation. While eradication for a season gives some immediate relief, seeds remain on the ground or soon migrate into the area. If the soil is open and disturbed, the weed reappears with favorable moisture conditions. Eradicants such as herbicides may be used successfully to reduce the bitterweed competition with grass in the early stages of a management program.

The management program must include rest periods for the bitterweed infested areas to allow the grasses and other desirable herbs to regain vigor. The initial renewal of root growth is retarded if the grass tops are continually removed. When above ground growth is allowed to remain throughout the growing season, the roots are able to expand resulting in increased top growth and improved vigor. Range grasses which are continuously and closely cropped can not produce sustained amounts of forage year after year. If grass is to control the habitat, controlled

grazing must be followed so as to maintain a good top-root balance. When grasses and the more desirable forage are in control of the habitat, there is no apparent bitterweed problem.

Progress in controlling bitterweed is being made in the area of most severe infestation and ranchmen are talking more in terms of grass and pounds of production and less in terms of the number of head of sheep the ranges can carry. Through the efforts of Soil Conservation Districts, County Agricultural Agents, and Experiment Station workers, more ranchmen are adopting good range management practices but until all operators combine action, bitterweed will not be controlled on Texas ranges.

LITERATURE CITED

1. BENNETT, D. R. 1924. Veterinarians Reports for weeks ending January 19 and 26, and February 2 and 9. Unpublished report from Texas Substation Number 14.
2. BOUGHTON, I. B. AND HARDY, W. T. 1937. Toxicity of Bitterweed (*Actinea odorata*) for Sheep. Texas Agricultural Experiment Station. Bulletin No. 552.
3. CLAWSON, A. B. 1931. "Bitterweed" Poisoning of Livestock. Mimeographed. Pathological Division, Bureau of Animal Industry, USDA.
4. CLAWSON, A. B. 1931. A Preliminary Report on the Poisonous Effects of Bitter Rubber Weed (*Actinea odorata*) on Sheep. Jr. Agr. Research Vol. 43, No. 8.
5. CORY, V. L., AND DAMERON, W. H. 1937. Range Studies of Bitterweed. Southwestern Sheep and Goat Raiser, Vol. 7, No. 11.
6. HARDY, W. T., CORY, V. L., SCHMIDT, H., AND DAMERON, W. H. 1931. Bitterweed Poisoning in Sheep. Texas Agricultural Experiment Station, Bulletin No. 433.
7. JONES, S. E., HILL, W. H., AND BOND, A. A. 1932. Control of the Bitterweed Plant Poisonous to Sheep in the Edwards Plateau Region. Texas Agricultural Experiment Station, Bulletin No. 464.