

Tansy Ragwort Biology and Eradication

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Tansy ragwort (*Senecio jacobaea* L., Asteraceae), a poisonous weed found in grassland and unmanaged ground, regularly causes livestock losses in the United States. It originated in Eurasia and has since spread to many countries to become a major poisonous weed. It is designated noxious by Idaho law and must be eradicated. This bulletin presents a strategy and specific methods for tansy ragwort eradication. Other bulletins explain how to manage tansy ragwort where infestations are too extensive to eradicate.

The only verified report of tansy ragwort in Idaho was made in August 1987 in a forested canyon along the St. Maries River downstream from Santa in Benewah County. The weed is currently the subject of an eradication program in that area. Reports of tansy ragwort in other areas have been investigated but have not been verified. This species is approaching Idaho from Washington and Oregon, increasing the likelihood of its appearance at other Idaho locations. It infests 40 percent of the pastures west of the Cascade Range in Oregon and Washington, requiring costly, intensive management to protect animals.

Description

Weed Biology

On forest or unmanaged land where tansy ragwort is allowed to grow and set seed undisturbed, it normally is a biennial. When mowed, grazed or otherwise injured, tansy ragwort occasionally behaves as a short-lived perennial. An undisturbed plant has a stout, erect or slightly spreading stem that may be branched; often a group of stems arise from the crown of a plant (Fig. 1). A fibrous system of coarse, light-colored roots spreads from the crown. These roots, or fragments of them, may produce small adventitious shoots. The production of adventitious shoots can be stimulated by mechanical destruction, pulling or other mutilation of the parent plant. Tansy ragwort usually germinates in fall or early winter, lives the next year as a rosette and dies the following year after producing flowers and seeds.

Tansy ragwort begins its first year as a seedling with smooth, uniform leaves (Fig. 2) then develops a dense rosette of basal leaves that vary in color, shape and hairi-



Fig. 1. (left) Tansy ragwort flowers are yellow, flat-topped and leafy on 2- to 4-foot stems. (right) Tansy ragwort can dominate pasture areas.

agricultural Extension agent for verification and mapping. Although landowners have every right to control their own weeds, for the sake of compiling a precise history of the location and status of tansy ragwort, it is preferable for county or state officials to control them. That is done at no cost to the landowner.

Because tansy ragwort is legally noxious and is presently known to occur in one small, scattered population in Idaho, eradication is conducted by the county and the Idaho Department of Agriculture. Complete eradication is a costly, time-consuming, tedious process that most people are unwilling to undertake. Complete eradication requires thorough, systematic searching of the entire affected region with detection of every plant by personnel who are well trained to identify and distinguish tansy ragwort and similar species.

The location of each tansy ragwort plant should be plotted on a large-scale map (preferably an aerial photo) and flagged or otherwise marked in the field. This will help in relocating treated sites, evaluating the treatment and verify searching effectiveness.

Searching should begin early in the flowering period and be repeated once every 2 weeks during flowering. At each examination, detected plants must be destroyed.

To kill the tansy ragwort plants, treat them thoroughly with a foliar herbicide or pull and bag them for later destruction. Remove and burn all flower heads. After pulling, immediately treat the area from which the plant was pulled with an herbicide.

For eradication of scattered plants, the preferred herbicide for spot treatment is picloram where permitted by label. Picloram will persist in the soil to suppress tansy ragwort plants and seedlings long after application without destroying grasses. Alternatives that provide some soil residual activity include triclopyr in forest and dicamba or sulfometuron where soil permeability is too high for picloram use.

Eradication does not require that all rosettes be found and destroyed during the first year of the eradication program. Rosettes that have not yet produced detectable flowers will do so during the next year or two and can be killed then, before they reproduce. Each rosette must eventually produce flowers or die from disease, weather or predation. Rosettes found during the survey should, of course, be destroyed and mapped.

Searching must extend well beyond known plant locations because seed may have blown or otherwise dispersed. Searching a mile or more beyond known locations of tansy ragwort is advisable, especially along travel routes, in other disturbed areas and in and adjacent to riparian areas. The destinations and other work areas of frequent business or industrial traffic in or through the infested area also should be examined.

Searching during flowering should continue once every 2 weeks for 5 years after the last plant is observed then once a year for at least 10 more years since seeds may live up to 15 years. Traffic through infestations should not be allowed until it is certain no seeds will be moved from the area.

The county weed superintendent should be immediately notified of any tansy ragwort found outside the area of the eradication search program. Detailed records of all tansy ragwort locations in Idaho, including maps and reports, are currently maintained on file by the Benewah County weed superintendent, the University of Idaho and the Idaho Department of Agriculture.

Eradication Methods

A strategy for tansy ragwort eradication must begin with a short-term measure such as foliar herbicide application to destroy flowering plants. It should continue with intermediate measures such as application of a soil-persistent herbicide to inhibit survival of new seedlings. Long-term measures should include a regular schedule of systematically detecting and destroying all remaining plants to prevent reproduction from seeds or crowns.

The following methods are discussed to show the strengths and weaknesses of each and their applicability to an eradication program.

Mechanical and Chemical Control

Cutting — Cutting or mowing is not recommended except where plants are soon to be eradicated. Cutting the stems before the early flowering stage reduces seed production but does not destroy the plant. Indeed, cutting encourages tansy ragwort development by stimulating the growth of side shoots. Cut plants often produce a second crop of short-stemmed flowering heads that are more difficult to cut. They may fail to die as biennials normally do, and may survive into the next year to produce a second seed crop and grow even more vigorously than uncut plants. Cut plants lying in the field pose a serious risk of poisoning to grazing animals and may still set and disperse seed. They should be removed and burned. For efficient eradication, herbicide treatment of the spot is necessary.

Pulling — Pulling is worthwhile in an eradication program if it is largely limited to plants with flowering stems, repeated consistently and accompanied by herbicide treatment of the pulled spot. Remove and burn all flower heads.

Pulling is feasible only for small infestations. Even where plants appear to have been pulled cleanly from the ground, small root fragments remain. These can give rise to new plants that establish readily in the space left by the parent plant. The method has been tried extensively in the United States and Europe and has been found laborious and ineffective for eradication over large areas.

ness. Usually, leaves are dark green on top, whitish-green underneath and divided into deeply cut, blunt-toothed lobes having a ragged, distinctively ruffled appearance (Fig. 3).

The leaf stalks and stem often are purplish. From late June onward in the second and later years of growth, one or more stout, leafy stems elongate to bear the flowers. At maturity, the flowering stems are up to 4 feet tall, pith-filled and branched toward the top. They bear conspicuous flat-topped clusters of yellow-petaled, daisylike heads that open from mid-July through mid-October.

Each head is composed of many tiny flowers and is encircled by bright-yellow ray flowers that appear as a fringe of 10 to 15 (usually 13) petals (Fig. 5). Each ray is from $\frac{1}{8}$ to $\frac{3}{16}$ inch wide and from $\frac{3}{8}$ to $\frac{5}{8}$ inch long. The heads are $\frac{3}{8}$ to $\frac{5}{8}$ inch in diameter across the top and in length. Each head is surrounded by a cup of black-tipped, green, leaflike bracts that are about $\frac{1}{16}$ inch wide and from $\frac{1}{4}$ to $\frac{3}{16}$ inch long.

Each yellow flower in a tansy ragwort head develops a single tiny seed that may be carried on the wind by a white pappus that acts as a parachute. When seeds are shed, the plant's life cycle is complete, and the plant normally dies. A single large plant may produce more than 15,000 seeds. Some of the seeds may be carried long distances by wind, especially in dry conditions, resulting in rapid spread of tansy ragwort infestations. Most seeds germinate in autumn or early spring before the development of tall, dense grass, but seeds will germinate whenever the soil is moist and warm. Some seeds may lie dormant in the soil for as long as 15 years.

Tansy ragwort grows well on many soil types. Its establishment is accelerated where other vegetation is sparse on soils of low fertility. It is often abundant in rodent-infested areas where mounding, grazing and scratching create disturbed conditions ideal for the establishment of seedlings. Rodents may cut tansy ragwort stems or roots and check normal flowering, but they do not significantly suppress infestations.

Distinguishing Tansy Ragwort

All other plant species are easily distinguished from tansy ragwort, but several have been mistaken for it, costing needless time and effort. Common tansy (*Tanacetum vulgare* L., Asteraceae), a perennial weed found in much of Idaho, resembles tansy ragwort in height, flower color and general shape, but its flower heads are buttonlike and lack tansy ragwort's fringe of petals (Fig. 5). Common tansy has a strong, pungent odor; tansy ragwort does not. Common tansy has deeply divided leaves with sharply pointed divisions (Fig. 4); tansy ragwort leaves are broadly divided with blunt lobes. Common tansy is more widespread in the Northwest, and while it also is poisonous, stock do not consume it in significant amounts.

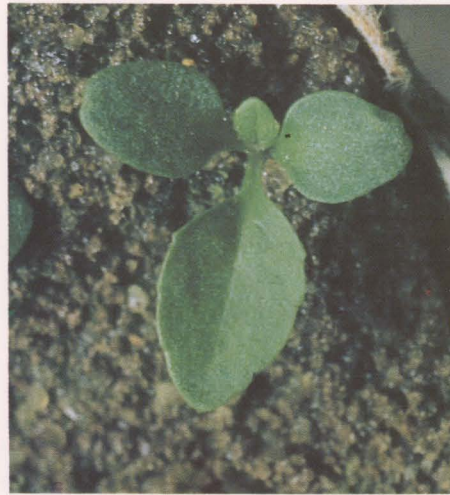


Fig. 2. Leaves of tansy ragwort seedlings are egg shaped at first.



Fig. 3. Rosette leaves have distinctively ruffled edges.



Fig. 4. Leaves of common tansy have serrated edges, and leaves of common groundsel have a "wing" or continuous band of leaf tissue on either side of the midrib.

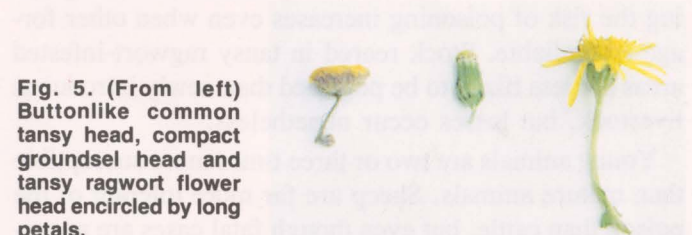


Fig. 5. (From left) Buttonlike common tansy head, compact groundsel head and tansy ragwort flower head encircled by long petals.

Common groundsel (*Senecio vulgaris* L., Asteraceae), found in many gardens and fields, is closely related to tansy ragwort and resembles it, but is an annual with weak, hollow stems no more than 12 inches tall. Several other closely related members of the *Senecio* genus are found in wild habitats, and some may be confused with tansy ragwort until the observer becomes familiar with it. All such closely related species, as well as other yellow-flowered plants that at first resemble tansy ragwort from a distance, are easily distinguished by comparing their leaves or flower heads with those of tansy ragwort.

If you think you may have found tansy ragwort in a previously uninfested location, send a specimen for confirmation to: Weed Diagnostic Center, Department of Plant, Soil and Entomological Sciences, University of Idaho, Moscow, ID 83843.

Toxicity

Where tansy ragwort is prevalent, it is one of the most common causes of livestock poisoning (cattle, goats and horses). No information is available on the susceptibility of wildlife. Several other *Senecio* species are also toxic but cause less loss. The true extent of losses is likely to be greater than is generally realized because cattle eating tansy ragwort do not always die. They may simply fail to grow, gain or produce to their potential. The cause can easily go unrecognized.

Contributing Factors

Poisoning is caused by tansy ragwort in pasture, hay or silage. Stock neither reject nor avoid it in hay or silage, and its poisonous alkaloids are unaffected by drying or ensiling. In silage, the alkaloids diffuse out of the tansy ragwort and into the surrounding material.

Cattle and horses grazing on range or pasture with adequate palatable forage usually avoid tansy ragwort. Animals that are newly turned out to pasture, hungry after travelling or on overgrazed pasture are much less discriminating and more likely to be poisoned. Where pasture is poor due to winter, drought or overstocking, animals may graze tansy ragwort. Animals deficient in certain minerals such as phosphorus may also be more prone to eating tansy ragwort. Young animals especially may eat tansy ragwort as an idle diversion even when ample forage is available. Tansy ragwort becomes more attractive to livestock after cutting and wilting. After herbicide spraying the risk of poisoning increases even when other forage is available. Stock reared in tansy ragwort-infested areas are less likely to be poisoned than newly introduced livestock, but losses occur nonetheless.

Young animals are two or three times more susceptible than mature animals. Sheep are far more tolerant of the poison than cattle, but even though fatal cases are appar-

ently rare in sheep, lambs from tansy ragwort-infested areas may not fatten readily. Cows affected by tansy ragwort poisoning produce less milk.

Poisoning Symptoms

Symptoms of tansy ragwort poisoning may appear quickly or may be delayed for several weeks or even months. For this reason, the cause is often overlooked. The sequence of events from the onset of symptoms until death varies with individual animals. Death may occur within 6 to 10 days of the first appearance of symptoms, or animals may lose their health over several weeks. Illness and death may be spread over a long period in a herd of affected animals. Many animals do not die from tansy ragwort poisoning but may remain in poor condition, existing as economic liabilities to their owners.

The early signs of tansy ragwort poisoning are loss of condition, poor appetite and constipation. As the disease worsens, the membranes lining the mouth, nostrils and eyelids lose color and may show the yellow discoloration of jaundice. Continuous futile attempts to pass feces result in prolapse of the rectum. In the advanced stages of the disease the brain is usually affected; horses show "sleepy staggers," and cattle become fierce and unapproachable. When advanced symptoms appear, death follows within a few hours. The typical postmortem symptom is a tough, fibrous liver.

The effects of tansy ragwort alkaloids on the liver are cumulative and irreversible, so a small intake of tansy ragwort over a long period may be just as damaging as a large intake on a single occasion. As little as 7 pounds fresh weight of tansy ragwort, or 1 percent of the animal's weight, is considered enough to kill a mature bovine. Recovery is impossible once the symptoms have appeared because the destruction of the liver is irreversible and treatment is ineffective. Livestock owners can prevent losses only by controlling the weed in range, pasture, hay or silage crops.

Eradication Strategy

Eradication consists of more than destroying growing plants in one particular year. It is total elimination of the species from the area, including seeds in the soil. Eradication is never assured until production and introduction of seed have been prevented for a time period longer than seeds can live in the soil (15 years).

Eradication of tansy ragwort protects the local community and the state as a whole, so eradication should be a community and state effort, not left up to the owners of infested land. Tansy ragwort found outside recorded infestations should not be destroyed or even disturbed before being reported to the county weed superintendent or

If the flowers have begun to produce mature, pappus-bearing seeds, the seed heads and the rest of the plant should be gathered gently into plastic bags to minimize escape of seeds. Always mark the exact location for future examination.

Tillage — Thorough plowing, where feasible, can kill most established plants. An annual crop rotation that includes tillage each year will destroy plants, prevent seed production and exhaust the supply of tansy ragwort seeds in the soil over a 15-year period. If a pasture or perennial crop is grown in the rotation, it will not be long before tansy ragwort reestablishes.

Herbicides — Young tansy ragwort seedlings are readily killed by certain herbicides. Second-year or older rosette plants are less susceptible. Good application technique and adherence to the label directions are essential for good control. Treating with minimum labelled doses in late June or early July gives good control of seedlings but poor control of second-year and older plants. Tansy ragwort becomes more tolerant of selective herbicides as stem elongation begins in early June. Where widely scattered plants or spot infestations exist, successful eradication with herbicides will likely require maximum doses labelled for tansy ragwort when the plants are flowering and most visible.

Herbicides for control of rosettes should be applied in early spring if the locations of the rosettes have been previously identified. The date of herbicide application for control of rosettes is not critical, however. Any time from spring to fall should give good results provided the foliage has not been killed by freezing. Autumn treatment of bolted plants will not aid eradication if the plants have produced seed because the plant's life cycle already is complete. Autumn spraying will fail to contact seedlings that germinate in winter and spring and consequently provides only one year of tansy ragwort control unless the herbicide has soil residual activity.

Without follow-up measures including improved grassland management, a single application of herbicide cannot be expected to control tansy ragwort. Herbicides that may be used for tansy ragwort control are listed in the *Pacific Northwest Weed Control Handbook* and other publications. All herbicides must be used in conformity with the container label.

Tansy ragwort dies slowly after treatment with hormone-type herbicides. Grazing where dense tansy ragwort stands have been treated with herbicide is not safe for at least 4 to 6 weeks after spraying because dying and dead plants are still poisonous. Allow plenty of time for the weeds to decay, and inspect to see how effective the treatment has been before grazing or using a heavily infested area for livestock.

Biological Control

Grazing — Sheep greatly weaken tansy ragwort plants by grazing them, beginning in early spring. Annual grazing by sheep of very sparse infestations will maintain a tansy ragwort population at a low level, but will not prevent the establishment and spread of an infestation. Grazing consequently cannot be relied upon as a primary eradication method. Seeds are carried in the wool, spreading tansy ragwort. Sheep should not be used as a main method of control of heavy infestations; the health of lambs especially is at risk if they eat large quantities.

Grazing cattle in a very lightly infested area is not apt to result in livestock poisoning. In an eradication program, grazing has both beneficial and adverse effects. It may enhance detection of tansy ragwort because cattle generally avoid tansy ragwort and consume vegetation that may inhibit the search and detection process. On the other hand, livestock and associated operations may spread tansy ragwort seed.

Vegetative Competition — Tansy ragwort will not establish as densely where a dense, vigorous crop of grass or other perennial vegetation already exists. Such a crop can best be achieved through controlled grazing, adequate fertilizer application, early removal of cattle and other precautions to prevent pasture damage from overgrazing.

Regular application of a nitrogen fertilizer promotes competitive pasture grasses. A seed mixture based on densely tillering, leafy, persistent and winter hardy varieties of perennial grass should be used for competitive ground cover. Where low to moderate nitrogen levels are being applied, clover is also valuable for keeping the pasture dense.

After herbicide use, extra nitrogen should be applied to stimulate grass production, which will compensate for the reduced competition from clover. Phosphate and sulfur fertilization of soils low in these nutrients will aid the recovery of clover.

Both overgrazing and undergrazing create susceptible spots where tansy ragwort and other weeds can readily establish. Moderate grazing leads to a closer, denser pasture. Good vegetative cover can aid eradication by suppressing tansy ragwort but may hamper searching if vegetation is large and not grazed. Grass is better than broadleaf vegetation because it is more quickly examined and distinguished from tansy ragwort during the search process.

Tansy Ragwort Parasites — The striking yellow- and black-banded caterpillar of the cinnabar moth, a Eurasian import, feeds solely on tansy ragwort. When this insect is abundant, it may weaken or even kill most of the plants before they can seed. Various other insect larvae feed on the flower heads and destroy some of the potential seed. Several rust diseases are found on tansy ragwort, but they

do not kill it. None of these has been proven effective in Idaho, so they cannot be depended upon to give satisfactory control. Parasites such as the cinnabar moth cannot be used to eradicate tansy ragwort because they depend on the weed for their own year-to-year survival.

Prevention

Long-Distance Spread

It is important to avoid introduction of this weed into uninfested land. Tansy ragwort is widespread west of the Cascade Range and is present to some extent in eastern Washington and Oregon. Animals from infested land should be flushed and cleaned of soil before they are released on uninfested land. Tillage, earth movement and logging equipment as well as other vehicles should be thoroughly cleaned of soil and trash with a high-volume hose before moving from infested to noninfested areas.

Local Spread

Methods of long-distance spread are also important factors in local spread. Small infestations of tansy ragwort can expand and spread to nearby areas very rapidly in late summer and fall because of seed movement by wind, water and wildlife.

The essential element in an eradication program is to stop seed production and spread. Pulling or cutting all plants before flower maturity and treating them with an appropriate herbicide, along with preventing movement of infested soil or vegetation, will stop expansion of tansy ragwort infestations and lead to eventual eradication.

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Pesticide Residues

Recommendations for use are based on currently available labels for each pesticide listed. If followed carefully, residues should not exceed the established tolerances. To avoid excessive residues, follow label directions carefully with respect to rate, number of applications and minimum interval between application and reentry or harvest.

Groundwater

To protect groundwater, when there is a choice of pesticides, the applicator should use the product least likely to leach.

Trade Names

To simplify information, trade names may be used. No endorsement of named products is intended nor is criticism implied of similar products not mentioned.