

PASTURE BRUSH WEED CONTROL IN THE VIRGIN ISLANDS



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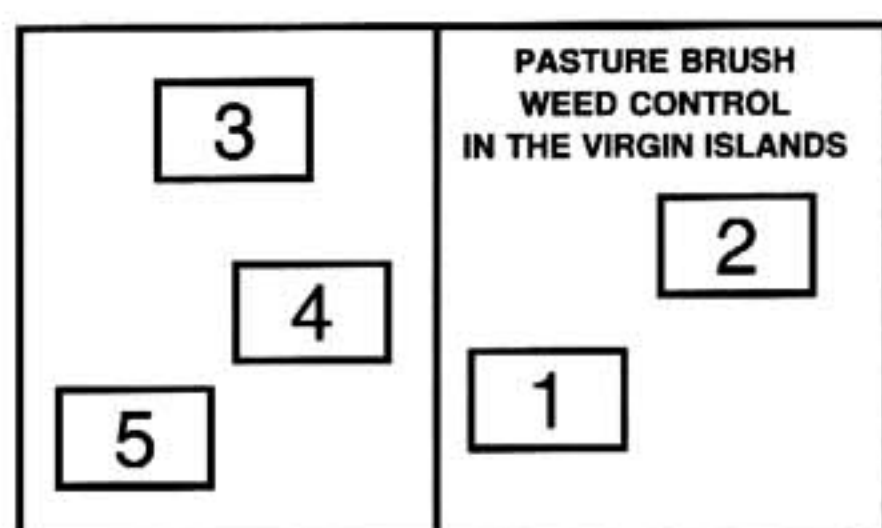
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Cover photos:

- (1) Physic nut (*Jatropha curcas*)
- (2) Casha (*Acacia tortuosa* & *A. macracantha*)
- (3) Castorbean (*Ricinus communis*)
- (4) Tan tan flower (*Leucaena leucocephala*)
- (5) Maran (*Croton astroites*)

Illustrations:

From *Trees of Puerto Rico and The Virgin Islands*, Second Volume, by Elbert Little, Jr., Roy Woodbury and Frank H. Wadsworth, U.S. Department of Agriculture, Forest Service Agricultural Handbook No. 449, September, 1974.

1. (Cover and inside back cover) *Acacia tortuosa* (L.), p. 253.
2. *Acacia macracantha*, p. 245.
3. *Psidium guajava* L., p. 417.
4. *Cordia alba* (Jacq.), p. 841.
5. *Croton astroites* Dryand., p. 397.

PASTURE BRUSH WEED CONTROL IN THE VIRGIN ISLANDS

Pastures make up approximately 80 percent or 15,000 acres of Virgin Islands farmland. They are dominated by guineagrass (*Panicum maximum*) and leucaena (*Leucaena leucocephala*) and provide the basic feed resource for the livestock industry. The mixture of guineagrass and leucaena foliage provides excellent nutrition to livestock on the range if properly managed. However, leucaena is an aggressive plant on Virgin Islands alkaline soils and is capable of quick development into a woody brush unless it is mowed or shredded at least once every year. It also tends to shed its leaves on the ground when cut and dried, leaving only branches and stems, and, therefore, it is unsuitable in hay fields. Other less desirable woody plants which may cause minor weed problems on pasture are manjack (*Cordia alba*), maran (*Croton astroites*), guava (*Psidium guajava*), physic nut (*Jatropha curcas*) and castor-bean (*Ricinus communis*).

Comparatively, casha (*Acacia* spp.) is the most noxious woody plant on Virgin Islands pastures, infesting 90 percent of the fields and reducing available pasture by nearly 40 percent. Both common types of casha (*A. tortuosa* and *A. macracantha*) are well adapted to the semiarid climate and calcareous soils of the territory. Additionally, they are extremely tolerant to fire, have high seed productive capacity and seed longevity. Moreover, their shrubby stems and branches are covered with woody spines which protect even young plants from livestock browsing. As the plants mature, the spiny horizontal branches combine to form impenetrable bushy thickets that reduce forage production and hinder movement of livestock and light machinery.

Pasture and Grazing management

The major cause of widespread brush encroachment on pasture is improper grazing management.

Proper pasture management in the Virgin Islands should include mowing of native pasture once yearly to remove unpalatable growth left by the grazing animal, stimulate new grass growth and control the development of shrubby weeds. Mowing not only prevents woody brush from flowering and setting seed but also invigorates grass growth and competi-

tiveness. Good grazing management provides for periods of rest to allow herbage to recover from grazing. This normally requires dividing the pasture into smaller units that are grazed in rotation (for example 3-7 days grazing followed by 28-35 days of rest). Many pastures in the Virgin Islands are in advanced stages of deterioration because of improper management and overgrazing. The optimum stocking rate (carrying capacity) for sustainable livestock production in the Virgin Islands varies from one adult cattle on 2 acres in the humid west to one adult cattle on 5 acres in the dry east end of the island (eight adult sheep are equivalent to one cattle unit). It is highly recommended

that farmers implement sound pasture and grazing management practices before any expensive brush control measures are attempted.

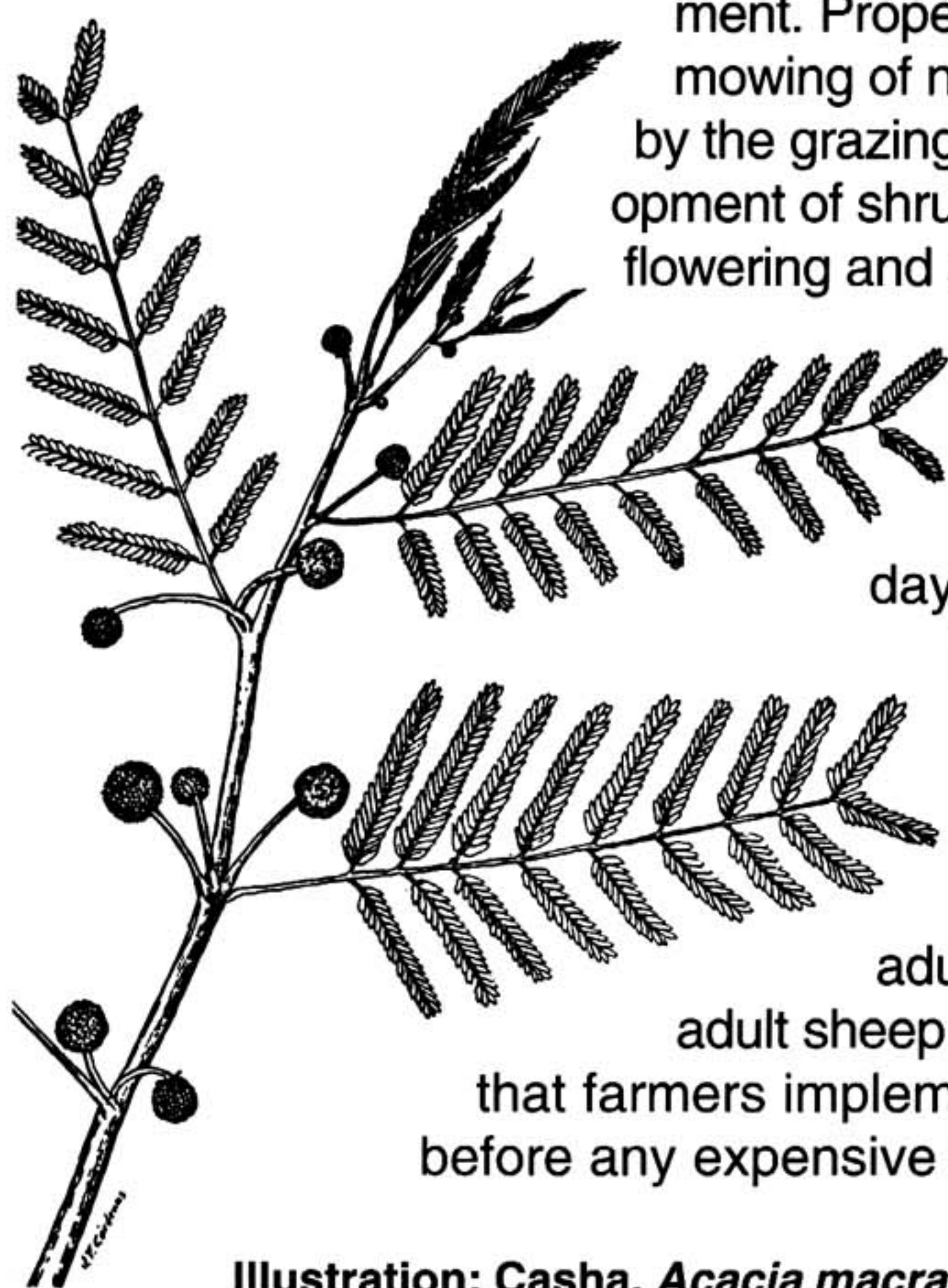
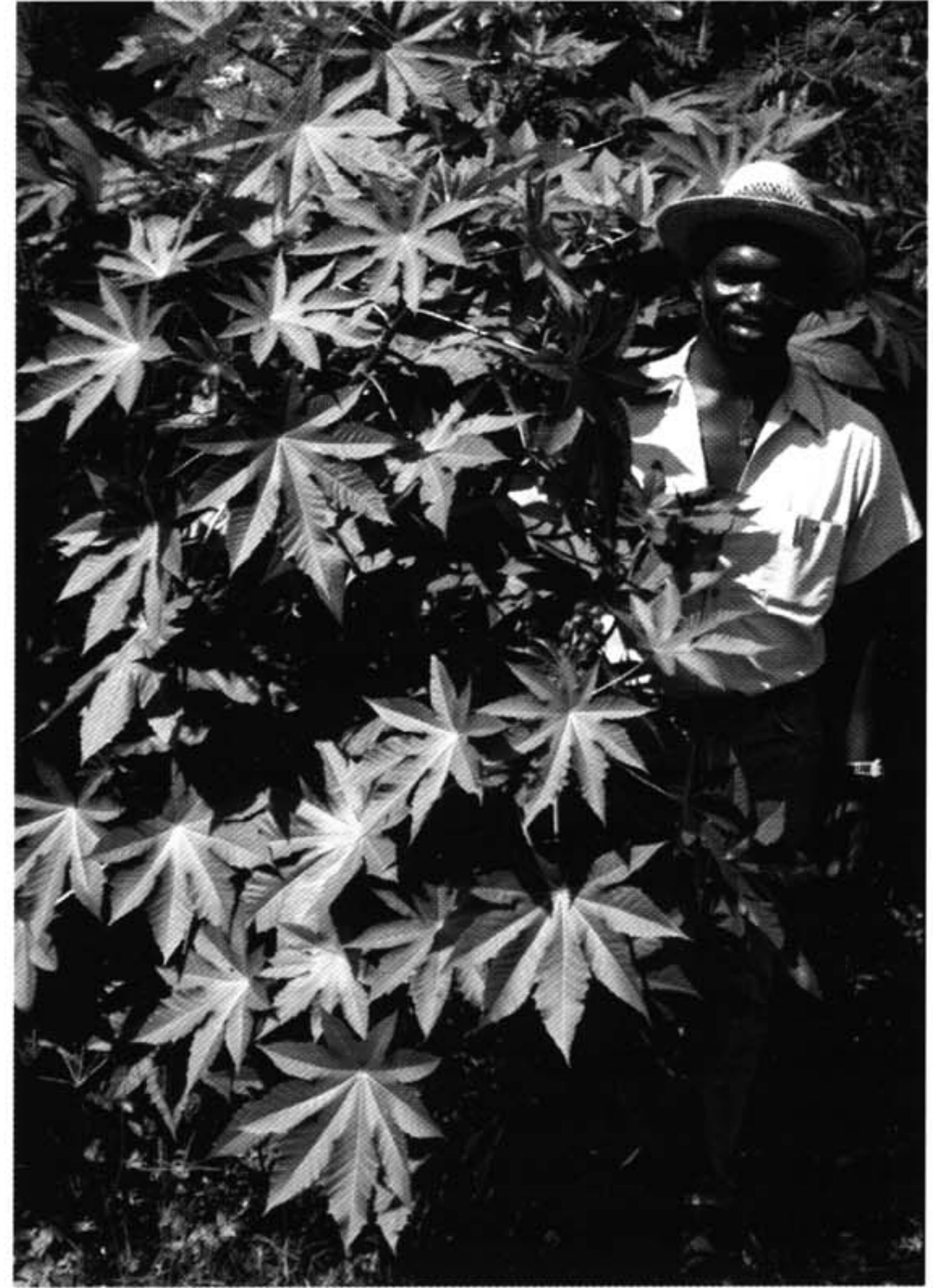


Illustration: Casha, *Acacia macracantha*

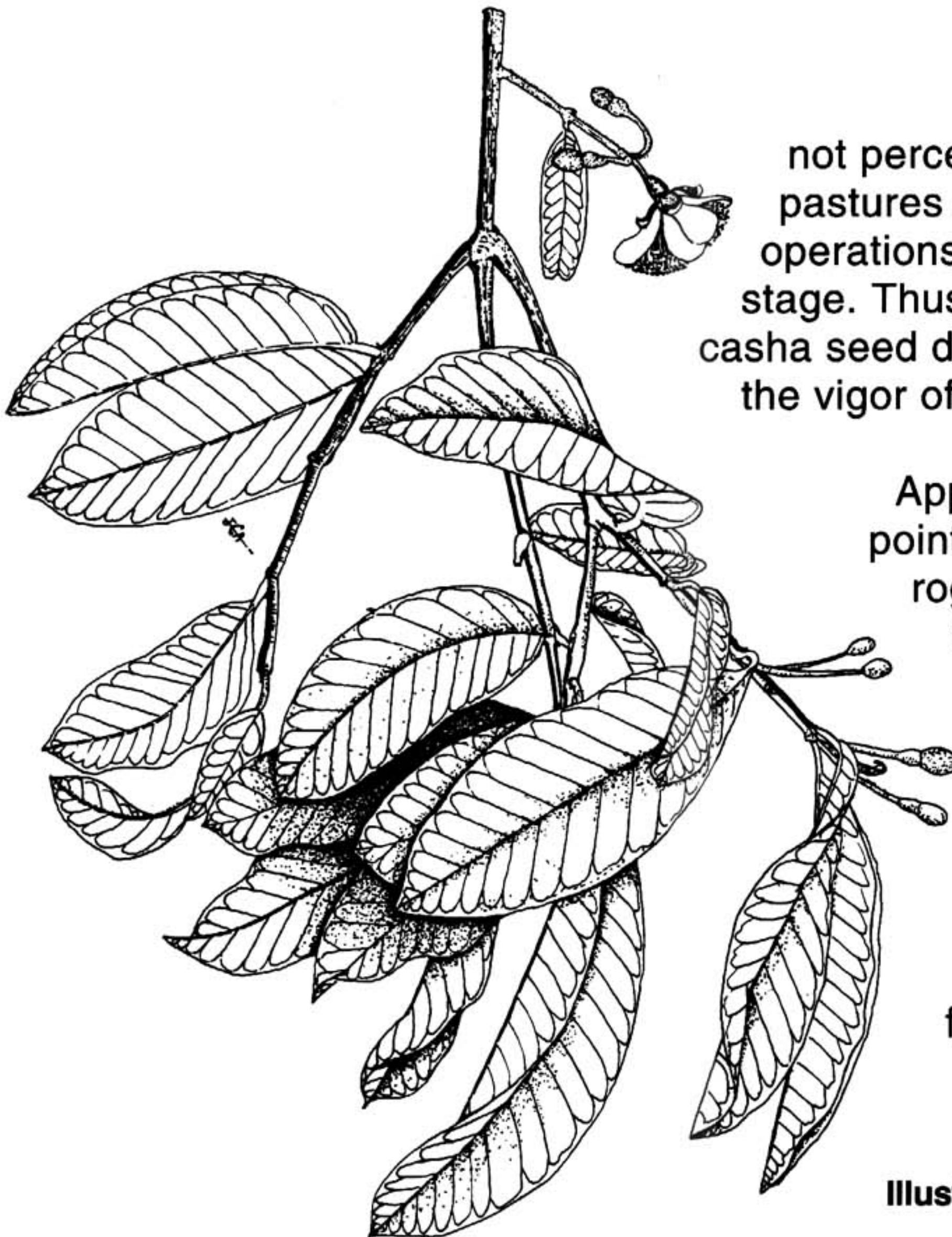
Traditional Brush Control Measures

There are two casha roguing methods commonly practiced in the Virgin Islands. These are: (1) mechanical roguing (severing and unearthing individual casha plants from below the first lateral roots) and (2) applying diesel oil to the basal growing points of individual plants. Mechanical roguing uses hand tools, tractors or bulldozers to cut and unearth plants. Hand tools commonly used for casha grubbing include the pick axe and mattock.

It is estimated that a bulldozer can remove from three to seven casha plants per minute depending on soil texture and moisture, plant density and operator skill. A major disadvantage of using tractors and bulldozers for mechanical roguing is the removal of the top soil and vegetation which adversely affects the physical condition of rangeland and promotes erosion. In addition, young plants are



Paul Flemming, AES Research Analyst, with castorbean.



not perceived to represent a major problem in pastures and are usually not removed in roguing operations until they have matured to seeding stage. Thus, mechanical roguing methods enhance casha seed dispersal and germination while reducing the vigor of desirable forages.

Application of diesel to the basal growing points of individual plants is the other common roguing practice. Diesel oil is a non-selective herbicide and must be applied carefully to avoid contacting adjacent forages. Furthermore, basal application of chemicals to individual casha plants is cumbersome, expensive and impractical over large areas. For these reasons, and the possibility of long-term soil contamination, the use of diesel oil for weed control is strongly discouraged.

Illustration: common guava, *Psidium guajava* L.



Martin Adjei, AES Research Associate Professor, with manjack.

Integrated Mechanical and Chemical Brush Weed Control

Although various mechanical and cultural control methods have been used for killing casha plants in the Virgin Islands, the most efficient and least disruptive to the environment is that which integrates mechanical shredding with specific translocated herbicides with little or no soil persistence.

The susceptibility of plants to herbicides is controlled by:

- (1) Stage of plant growth when treated
- (2) Herbicide concentration absorbed by plant
- (3) Inherent physiological and morphological plant characteristics
- (4) Inherent toxicity of the herbicide
- (5) Environmental factors such as light, temperature, wind and, with soil-applied herbicide, soil characteristics.

Generally, the stages of growth in which plants are most susceptible to applied herbicides are:

- (1) when rapid growth is taking place and (2) when a period of rapid growth has just ended and

food reserves are temporarily depleted or exhausted. Hence, as a rule, seedlings, young plants and new regrowth are most susceptible. Dormant and non-germinating seeds and older plants are not as adversely affected by herbicides.

Herbicides must gain entry into targeted plants and be translocated to susceptible sites in concentrations great enough to induce the desired response. Obstacles to entry and movement of foliar-applied herbicides in plants include waxy and hairy leaf cuticle, water stress, heavy precipitation immediately following application, external and internal make-up of the plant such as leaf-angle, location of growing points and ability of the plant to inactivate or even break down the chemical ingredient in the herbicide. Therefore, herbicides must be carefully selected and applied in a proper and timely manner to control targeted plants.

Based on 5-year experimental results at the UVI-AES, it is strongly recommended that chemical brush weed control on pastures in the Virgin Islands be preceded by mowing or shredding 2-3 months before application. Ideally, pastures should be shredded after grazing in February. The shrubs, because of their deep rooting system, will initiate regrowth during the subsequent dry spell whereas grasses will remain relatively dormant. Selective herbicides are then applied when brush is still in the lush, active stage of regrowth (2-3 months regrowth or up to 3 feet high), but before they flower and/or set seed, in order to prevent a build-up of seed reserves in the soil. Spraying herbicides on young regrowth also carries with it the advantages of reduced chemical dosage necessary for control and reduced areal drift compared with spraying tall trees.

The following herbicides have resulted in excellent woody brush control on pastures in the Virgin Islands when applied under the right conditions and in the correct way: dicamba, picloram, triclopyr and tebuthiuron. They are described in detail below:

RECOMMENDED FOLIAR-APPLIED HERBICIDES

Dicamba (Banvel, Trimec Super Brush Killer)

Dicamba (3, 6-Dichloro-2-methoxy benzoic acid) belongs to the benzoic acid herbicide family. It is produced by Sandoz Crop Protection Corp. Pure dicamba is marketed as a liquid formulation of either the potassium or dimethylamine salt under the trade name Banvel. It contains 4 pounds of active ingredient (ai) per gallon of product. Banvel bears the EPA safety signal word "WARNING" and is nontoxic to bees and fish.

Dicamba possesses plant regulatory properties similar to the phenoxy-carboxylic herbicides. It interferes with nucleic acid metabolism and disrupts the transport system in plants due to induced massive cellular proliferation. In addition to its foliar activity, dicamba also persists in the soil for a period of time resulting in control of germinating seedlings. The plant selectivity of dicamba is based on the ability of tolerant plants like grasses to rapidly degrade it metabolically while broadleaf plants are unable to degrade it quickly enough.

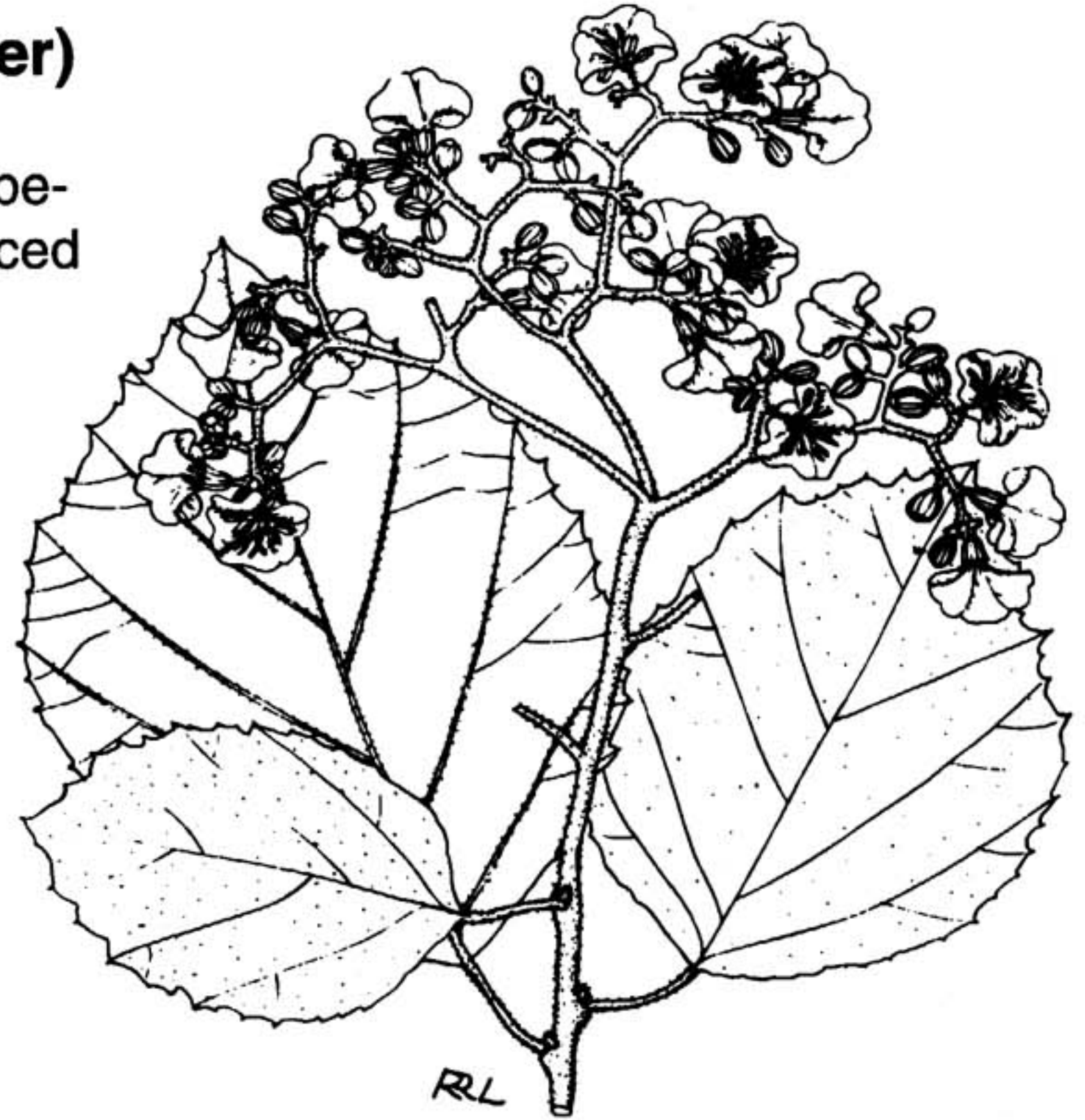


Illustration: white manjack, *Cordia alba* (Jacq.)



Olasee Davis, CES Natural Resources Specialist, with casha.

Several combinations of dicamba with other herbicides offer effective control of brush weeds. They include Trimec Classic (dicamba + 2,4-D + MCPP); Trimec Brushmaster/Brushkiller (dicamba + 2,4-D + 2,4-DP) and Mondak (dicamba + MCPA).

Use 2 pounds active ingredient of dicamba per acre. Re-treatment of casha with the same dosage is often necessary within a year to control incompletely-killed roots and crowns.

Picloram (Grazon, Tordon, Pathway, Access)

Picloram (4-amino-3,5,6-trichloropicolinic acid) is also a hormone-type herbicide used for the control of woody broadleaf plants in rangeland and non-crop areas. Most grass species are tolerant to picloram, and selective control of broadleaf weeds with picloram in grass crops is feasible. It is rapidly absorbed by foliage and roots of broadleaf plants, and it is readily translocated throughout the plant via phloem and xylem tissues—accumulating in regions of active growth. It is usually formulated as a water-soluble liquid with a blue-green color and alcoholic odor. The more concentrated formulations of picloram such as Grazon PC, and Grazon P + D carry the EPA safety signal word “WARNING.” They are restricted use pesticides (RUP) and do require a licensed applicator to dispense. Other formulations such as Tordon (picloram + 2,4-D), Pathway (triisopropanolamine salt of picloram + 2,4-D) and Access (picloram +triclopyr) bear the EPA safety signal word “CAUTION.” Picloram related herbicides are produced by DowElanco. Picloram has the ability to seep or leach in sandy soil and must not be applied where the water table of an underlying aquifer is shallow. It is nontoxic to bees but toxic to fish.



Tan tan on St. Croix.

Use up to 1 pound acid equivalent per acre, annually, without any re-treatment.

Triclopyr (Remedy, Garlon 4, Grazon ET, Pathfinder, Crossbow, Confront)

Triclopyr (3,5,6-trichloro-2-pyridinyloxy acetic acid) is an amber-colored liquid which has low volatility and photodegrades. Therefore, it must be kept away from light. It is produced by DowElanco. Triclopyr is also hormonal in action, affecting broadleaf plants selectively. It degrades quite rapidly (half life = 20-40 days) in the soil from microbial activity.

Pure triclopyr-amine formulations such as Garlon 3A, Grandstand, Redeem and Turflon carry the EPA safety signal word “DANGER” because they can cause skin and eye irritation and are toxic to fish. The triclopyr-esters including Remedy, Garlon 4, Grazon ET and Pathfinder are less toxic and bear a signal word “CAUTION.” These may be used on pastures in the Virgin Islands.

Triclopyr combination formulations recommended for brush control on pasture are Crossbow (triclopyr + 2,4-D), Confront (triclopyr + clopyralid) and Access.

The maximum rate of triclopyr allowed during any year is 1 pound acid equivalent per acre.

General Precautions/Restrictions on Foliar-Applied Herbicides

(1) Herbicide should be applied in sufficient volume of water (20-30 gallons per acre) to ensure complete foliar coverage.

(2) Addition of a non-ionic surfactant at a concentration of 16 fluid ounces per 100 gallons of water will promote herbicide absorption by plants and enhance control.

(3) Do not spray under windy conditions that will allow spray to drift to edible food or feed crops, cropland or water which will be used for irrigation or domestic use.

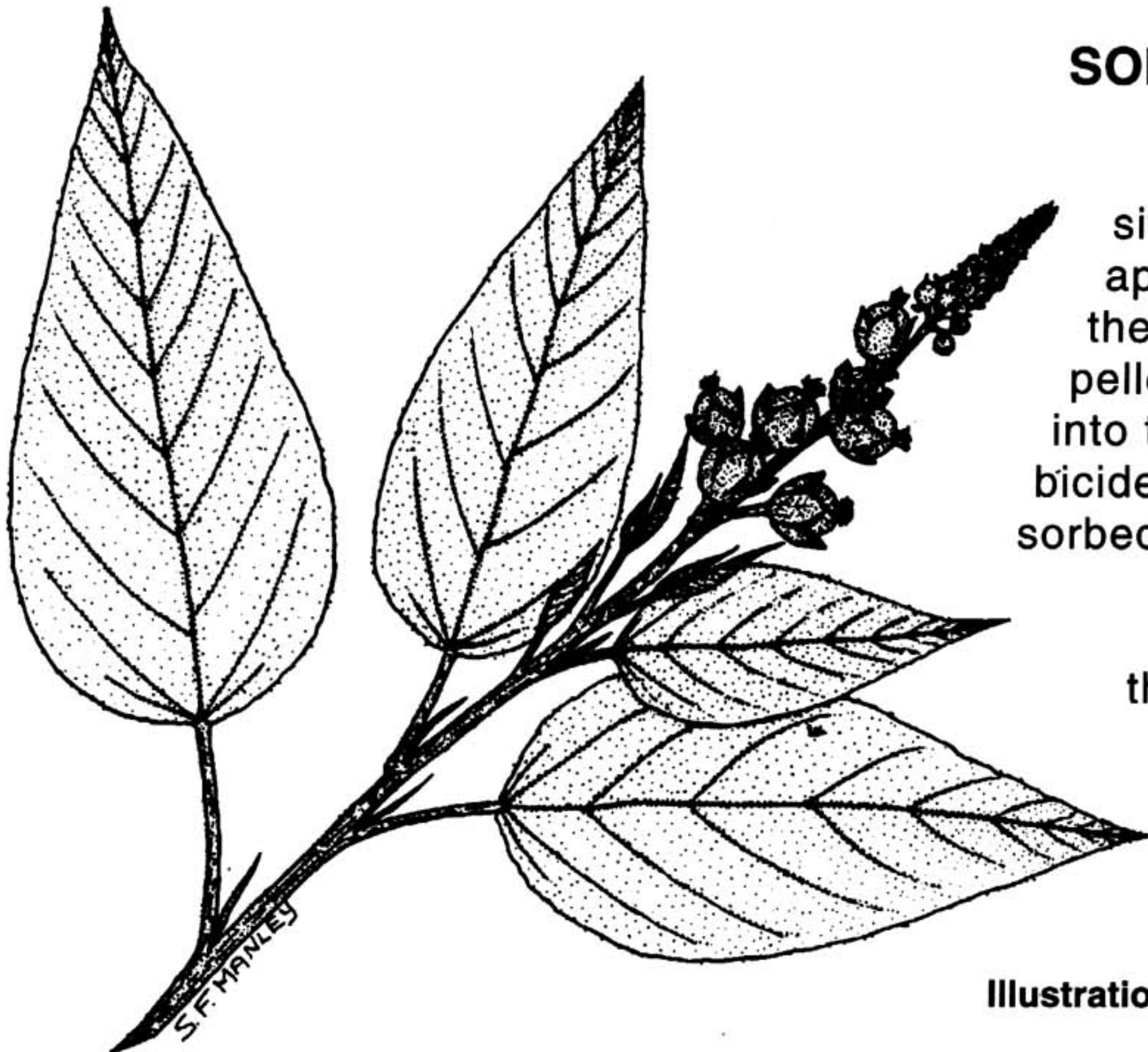
(4) With the exception of pure picloram, do not graze meat animals on or harvest forage for hay within 30 days of treatment and withdraw meat animals from treated fields 7-30 days (depending on herbicide label) before slaughter.

(5) Do not graze lactating dairy animals on treated fields for 90-365 days following treatment.

(6) Be sure to read the herbicide label carefully before application. This is required by law.



Olasee Davis operating boom sprayer.

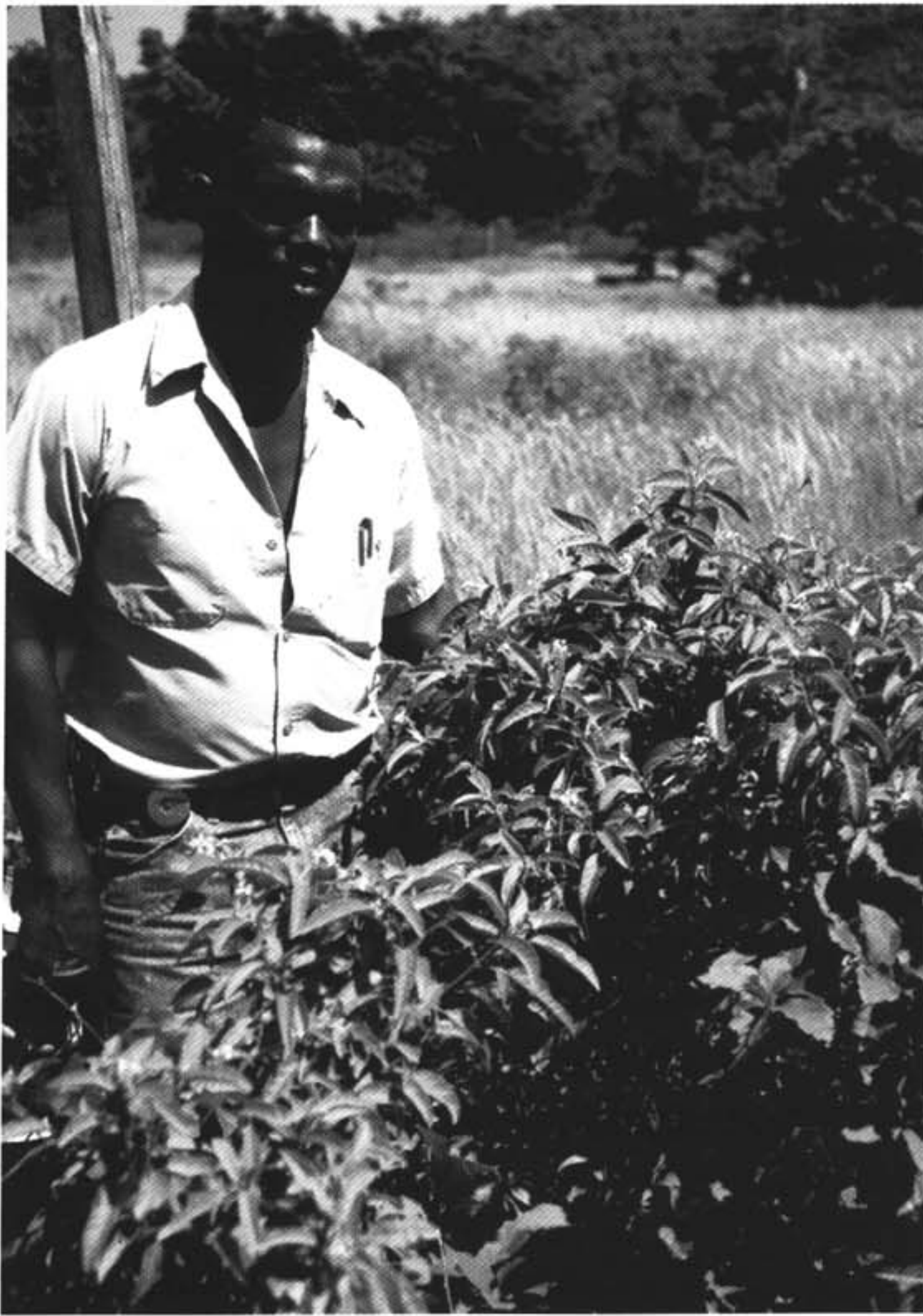


SOIL-APPLIED HERBICIDES

The roots of plants are an important site of entry into the plants for soil-applied herbicides. After application, the first significant rain dissolves the pellets or granules, moving the herbicide into the soil. Additional rainfall takes herbicide into the root zone where it is absorbed by the roots of woody plants.

In the case of Spike (Tebuthiuron), the herbicide is then translocated to the stems and leaves where it inhibits the leaves' ability to produce food (photosynthesis). Leaves turn yellow and die. Hence,

Illustration: Croton astroites Dryand.



Paul Flemming with maran (*Croton astroites*).

most systemic, soil-applied herbicides work slowly but surely, and may take 6-12 months to complete woody brush kill.

Tebuthiuron, which is commonly marketed under the trade name Spike 20P, is a very effective soil-applied herbicide for the control of both casha and leucaena along the fenceline. Spike is also safe to use. Its heavy clay pellets prevent lateral movement of herbicide from target plants to sensitive crops or plants.

Once in the soil, spike is strongly adsorbed onto clay soil particles from where it is picked up by targeted plants or broken down by microorganisms. Strong adsorption to soil particles means minimum lateral movement and leaching losses from the application site. It degrades with time, and, because re-application is infrequent (2-3 years), there is no soil accumulation.

Being 80 percent inert clay, Spike 20P pellets are unattractive to animals and selective consumption by livestock is unlikely. If inadvertently consumed by livestock, toxicity

is low: the herbicide is rapidly excreted and does not accumulate in animal tissue.

In all research studies, Spike has never been found deeper than 24 inches below the surface of clay soil.

Safety Precautions for the Use of Spike

- (1) No surface application of Spike should be made to highly permeable soil such as loamy sand to pure sand.
- (2) No application is allowed where the water table of the underlying aquifer is shallow (less than 5 ft) or within 200 ft of established dams or waterways.
- (3) No surface application should be made on slopes greater than 10% in order to prevent erosion losses. Injection into soil is the preferred method on steep slopes.
- (4) Read and obey the full herbicide label as required by law.

APPLICATION GUIDELINES

Herbicide	Rate	Suggested Pre-treatment	Method of Application	Application Interval	Expected Control
Banvel	2 lb/acre(A)	Shred pasture & allow 2-3 months regrowth	Foliar broadcast	6 months for first year, then annually	80-90%
Trimec Super Brushkiller	2 lb ai ¹ /A	Shred pasture & allow 2-3 months regrowth	Foliar broadcast	6 months for first year, then annually	85-90%
Tordon RTU	0.5 lb ae ² /A	Shred pasture & allow 2-3 months regrowth	Foliar broadcast	1 year	90-95%
Pathway	0.5 lb ae/A	Shred pasture & allow 2-3 months regrowth	Foliar broadcast	1 year	90%
Access	0.25-0.5 lb ae/A	Shred pasture & allow 2-3 months regrowth	Foliar broadcast	1 year	90-95%
Remedy	0.5 lb ae/A	Shred pasture & allow 2-3 months regrowth	Foliar broadcast	1 year	90%
Crossbow	0.5 lb ae/A	Shred pasture & allow 2-3 months regrowth	Foliar broadcast	1 year	90%
Garlon 4	0.5 lb ae/A	Shred pasture & allow 2-3 months regrowth	Foliar broadcast	1 year	90%
Spike 20P	4 grams/plant	Shred pasture & allow 3 month regrowth	Basal spot	2-3 years	100%
Spike 20P	7 grams/plant	Mature plant	Basal spot	2-3 years	100%

¹active ingredient

²acid equivalent

Trade names have been used to simplify information; no endorsement is intended.

WARNING

Use pesticides with care. Apply them only to plants or sites listed on the label. When mixing and applying pesticides follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets and livestock.

The law requires that pesticides be used as the label directs. If there is any apparent conflict between label directions and the pesticide uses suggested in this publication, consult the Cooperative Extension Service at (340) 692-4080 or the Agricultural Experiment Station at (340) 692-4020.



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