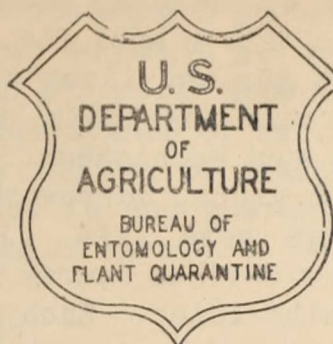


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E-562



THE USE OF DERRIS AND CUBE WASHES AND DUSTS
IN THE CONTROL OF CATTLE GRUBS 1/

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INTRODUCTION

Experiments conducted by the Bureau of Entomology and Plant Quarantine, as well as actual ranch practice, have shown that the abundance of cattle grubs (Hypoderma lineatum (DeVill.) and H. bovis Deg.) can be greatly reduced and the annoyance by the adults, or heel flies, very largely eliminated by applications to the backs of infested cattle of a wash containing powdered root of either derris or cube, or by applications of a dry dust consisting of the powdered root and wettable sulfur. The application should be made before any of the grubs drop from the backs and should be repeated about once a month during the season when the grubs are present in the backs of cattle. For the larger herds of cattle the wash can be diluted and applied more rapidly and economically with a powered sprayer.

The applications must be thorough. Each treatment results in the destruction of about 95 percent of the grubs present at the time. Some of the dead grubs are forced out of the sacs. The dead grubs that remain under the skin are absorbed in a few weeks.

HABITS OF THE CATTLE GRUBS 2/

The grubs ("warbles" or "wolves") in the backs of cattle are the young, or larvae, of the heel flies. When the grubs have attained their full growth in the back each grub crawls out of the pocket, or cyst, which it has occupied for 5 weeks or longer and drops to the ground. On the

1/ This circular supersedes E-496, The Use of Derris and Cube Washes
i n the Control of Cattle Grubs, which was issued in February 1940.

2/ For more technical and detailed information on the habits of
cattle grubs see Farmers' Bulletin No. 1596, "Cattle Grubs or Heel Flies
with Suggestions for their Control."

ground it pupates as promptly as climatic conditions will permit, and 4 or 5 weeks later the pupa changes into a heel fly. The female fly goes to the cattle merely to lay her eggs and she lives only a few days. Usually the eggs are laid on the hair around the hoofs, but occasionally they may be laid on hair along the belly and escutcheon. In a very few days the eggs hatch, and the tiny larvae, or grubs, burrow through the skin near the base of the hair upon which the eggs were laid. Having thus effected an entrance, the young grubs pursue a devious course through the body of the animal, reaching the back about 9 months later. Each grub makes a hole in the skin of the back and remains in close contact with the opening, through which it gets air. In this location the grub completes its growth while the tissues of the host form a pocket, or cyst, around it. It is here also, before the grub escapes to the ground, that the stock owner has the best opportunity to destroy it. Being open to the air, the cyst may become contaminated with bacteria. Pus and swellings occur in many cases.

LOSSES AND DAMAGES

The serious losses to the cattle industry are well known (see Farmers' Bulletin No. 1596). In addition to the great damage to the meat and the leather caused by the grubs, the cattle are extremely annoyed by the flies. When the heel fly attempts to lay her eggs the cattle become frantic and rush madly from their feed or rest to the protection of shade, mud, or water. Sometimes the fright is sufficient to cause a stampede. The heavy loss in milk production immediately resulting is well known by dairymen.

THE WASH, AS APPLIED BY HAND

Materials

In addition to the water only two materials are needed for making the wash. Either cube powder or derris powder is used as the principal ingredient. Either neutral soap or wettable sulfur is used as the companion ingredient.

Cube or derris powder

Powdered root of cube is recommended. Better results have been obtained with cube powder than with derris powder when the rotenone content has been approximately equal. Therefore, unless cube powder is the more expensive, it should be used. It is important that the powder used be finely ground, and a commonly accepted standard of fineness is that 90 percent will pass through a 200-mesh screen. Rotenone is the principal toxic ingredient in the powders. The directions given here are based on powders containing 5 percent of rotenone. Powders of such content have been readily obtainable. Powders of lower rotenone content can be used in a sufficiently larger proportion to give the equivalent of powder containing 5 percent. For example, it would require 1-1/4 pounds of powder containing 4 percent of rotenone to be equal to 1 pound of powder containing 5 percent of rotenone.

Until recently, cube containing 5 percent of rotenone was obtainable at a retail price of about 40 cents per pound, and derris was usually slightly higher in price. The prices of 4-percent powders are usually about 20 percent lower. For the convenience of users the following list of manufacturers and dealers in cube and derris powder is given. No claim is made that the list is complete, nor is any guarantee here expressed or implied for the products of the companies listed.

Wholesalers and manufacturers:

Agicide Laboratories, 4668 N. Teutonia, Milwaukee, Wis.
Arkansas Fertilizer Co., Little Rock, Ark.
Chipman Chemical Company, Inc., Bound Brook, N. J.
Derris, Incorporated, 79 Wall St., New York, N. Y.
Dodge & Olcott Co., 180 Varick St., New York, N. Y.
Hammond Paint and Chemical Co., Inc., Beacon, N. Y.
J. L. Hopkins & Co., 220 Broadway, New York, N. Y.
McConnon & Company, Winona, Minn.
McCormick and Co., Baltimore, Md.
Niagara Sprayer & Chemical Co., Inc., Middleport, N. Y.
Pan-American Rotenone Corporation, 60 East 42nd St., New York, N. Y.
S. B. Penick and Co., 50 Church St., New York, N. Y.
John Powell & Co., Inc., 114 East 32nd St., New York, N. Y. (also Dallas, Tex.).
R. J. Prentiss and Co., Inc., 80 John St., New York, N. Y.
Schollenbarger Feed Co., Mosquero, N. Mex.
Seacoast Laboratories, Inc., 156 Perry St., New York, N. Y.
Sherwin-Williams Co., Chicago, Ill.
Southwestern Drug Corporation, Dallas and Fort Worth, Tex.
Stanco., Inc., 2 Park Ave., New York, N. Y.
Andrew Wilson, Inc. Springfield, N. J.

Retailers:

Arkansas Fertilizer Co., Little Rock, Ark.
Denver Fire Clay Co., Denver, Colo.
Jim Ingwersen Co., Canadian, Tex.
McConnon and Co., Winona, Minn.
Musser Lumber Co., Seymour, Tex.
Schollenbarger Feed Co., Mosquero, N. Mex.
United Chemical Co., 2500 Eagle Ford Road, Dallas, Tex.

Soap

Neutral soap, such as is employed in soft water to wash woolen articles, should be used. It has been found that hard-water soap or home-made lye soap is alkaline and makes the rotenone in the powder less effective. Flaked or granulated soap dissolves in the water more readily than bar soap. Apparently bar soap is just as effective, however, and it can be used where time for dissolving it is available.

Wettable sulfur

Wettable sulfur is a desirable substitute for soap in the wash. It wets promptly; it is usable in either hard or soft water; no heat is required; the cube powder and the sulfur can be blended together dry beforehand, ready to be added to the water. Slightly better results are obtained than when soap is used.

The wettable sulfur needed is the kind especially prepared and commonly used for dipping cattle and goats. It is finely ground and contains a detergent which makes it readily wettable. In some localities such wettable dipping sulfur is carried in stock by dealers, while in other localities information may be needed as to sources of supply. For the convenience of users of wettable dipping sulfur the following names of manufacturers and dealers are given. No claim is made that the list is complete, nor is any guarantee here expressed or implied for the products of the companies named.

Arkansas Fertilizer Co., Little Rock, Ark.
Bandera County Ranchmen and Farmers Assoc., Bandera, Tex.
Best Chemical Co., Lubbock, Tex.
H. O. Byrd & Co., San Angelo, Tex.
Close Drug Co., Hereford, Tex.
Denver Fire Clay Co., Denver, Colo.
J. W. Dollahite, Marfa, Tex.
J. T. Easley, Lovington, N. Mex.
Equipment Supply Co., El Paso, Tex.
Henrietta Drug Co., Henrietta, Tex.
Jim Ingwersen Feed Co., Canadian, Tex.
Mimbres Valley Farmers Assoc., Deming, N. Mex.
Mitchell Feed Co., Roswell, N. Mex.
Musser Lumber Co., Seymour, Tex.
Refugio Pharmacy, Refugio, Tex.
Roswell Cotton Oil Co., Roswell, N. Mex.
Ruoff Milling Co., Albuquerque, N. Mex.
Shollenbarger Mercantile Co., Mosquero, N. Mex.
Southern Acid & Sulphur Co., Rialto Bldg., St. Louis, Mo.
(manufacturer)
Stauffer Chemical Co., Freeport, Tex. (manufacturer)
Texas Stockmen's Supply Co., San Angelo, Tex.
Walter Verhalen Co., Weslaco, Tex.

Water

Hard waters contain certain salts that precipitate some of the soap and make the wash less effective. Therefore when soap is used soft water should be used. Rain water is satisfactory. Where rain water is not available, soft water can be obtained from laundries or from ice-manufacturing plants. Where wettable sulfur is used instead of soap, either hard or soft water is satisfactory.

Quantities of Materials Needed

The materials are mixed in the following proportions:

Water	- - - - -	1 gallon
Either cube or derris powder	- - - - -	12 ounces
(Soap	- - - - -	2 ounces
Either (	or	
(Wettable sulfur	- - - - -	6 ounces

One gallon of the wash is sufficient to treat the backs of from 12 to 16 adult cattle, depending on length and thickness of the hair. For example, during January, in King County, Tex., 1 gallon was sufficient to treat 16 cattle, while in Colorado, where the coats of hair are heavier, this quantity (1 gallon) was sufficient for only 12 cattle. It is essential that enough be applied to saturate the hair and wet the skin.

Preparation of the Wash

When soap is used

Warm water should be used in order to dissolve the soap rapidly and to aid in good penetration of the hair. To save time, the cube or derris powder should be weighed out in paper bags ahead of time. When a large number of cattle are being treated it has been found expedient to dissolve 24 ounces of soap in 12 quarts of water heated in a large bucket over a wood fire. After the soap has all dissolved, each of the 12 quarts contains 2 ounces of soap. One quart of this soapy concentrate is added to 3 quarts of warm water to make each gallon of wash.

The powder is first dumped from the paper bag into the bottom of a pail, the soap-water mixture is then added slowly while the powder is worked into a smooth paste, and finally the rest of the measured soapy water is added and thoroughly stirred.

When wettable sulfur, instead of soap, is used in the wash

The cube or derris powder is first mixed dry with the wettable sulfur, then wetted by some of the water and stirred to a muddy paste, then the rest of the water is added and the mixture stirred thoroughly. No heating is necessary.

Method of Application

A stiff brush and a dipper or a glass fruit jar with perforated top are needed by each person applying the wash. The brush should be one with stiff fibers. The short-handled type used for scrubbing the under surfaces of automobiles is satisfactory. The fibers are of palmetto and do not soften so readily as those of the ordinary white-fibered brushes. These brushes may be obtained at about 25 cents each at hardware stores or at stores specializing in automobile accessories.

As often as the brush becomes matted with hair it should be cleaned. This can be done quickly by means of a multiple-pronged ice chipper or a board containing many nails driven at a slant.

A dipper may be used by pouring the wash over the backs of the cattle. The bowl of the dipper should be dented on one side, at the proper levels, so that the operator can judge about how much wash he is applying to each animal. Usually, however, and especially if the cattle are treated in a high chute, a glass jar with a perforated metal top is more convenient for handling the wash. Ten or twelve holes are made with a nail in the metal top of a 1-quart fruit jar. The jar is inverted and shaken over the back. A quart should be sufficient for at least 3 cattle.

The wash should be thoroughly stirred in the pail each time a dipper or jar is filled. The stirring can be done with the dipper or with a paddle.

As the wash is poured slowly over the back, the brush is used vigorously to distribute the wash and to rub it deeply into the hair, and also to remove the scabs from the grub holes. Vigorous and continued rubbing is required for best results. Where the coats of the cattle are extremely thick the best results are obtained by laying the brush aside after the wash is distributed over the back and continuing the rubbing for 1 minute with the fingers of both hands. The object is to have the wash reach each warble opening in the skin.

It is wasteful to apply so much of the wash to the back that it runs off, but it is important to apply all that will stay in the hair.

Wire brushes should not be used, since they may injure the skin of the animal.

Schedule of Application

The first application should be made before any of the grubs drop from the back. The grubs become almost black before they drop; therefore, when a few of the grubs are found to be of a dark shade the first application of the wash should be made at once.

The cattle grub season varies greatly with the latitude and to some extent from year to year. In King County, Tex., in 1938, the first application of the wash was made about the first of November. In the southeastern part of Colorado a few grubs have been found ready to drop about December 15; in the central part of Iowa, about February 20; in North Dakota, about March 15. The second and third applications should be made at 30-day intervals. This is important because some grubs continue to arrive at the back and are not affected by the earlier treatments.

Some herdsmen prefer not to wet the cattle on a very cold day unless they are stabled, because it takes the backs an hour or more to dry. The water and the evaporation intensify the cold.

In some localities the county agricultural agents have aided in organizing cooperative efforts among farmers or ranchers, and in such cases more effective control can be expected. On individual ranches in Texas, however, it was found that the abundance of grubs and heel flies was greatly reduced by individual efforts.

Cost of Treatment

The cost of the materials is approximately 2 cents per head per treatment. One man can apply the wash to about 30 head of cattle in an hour. Of course the total cost is affected by the time required to round up all animals and to put them through the chute.

The cost of materials is reduced by about one-half and the labor of application is practically eliminated by the spray method, next to be discussed.

THE WASH, AS APPLIED BY SPRAYER

Treating the larger herds of cattle has been greatly simplified by experiments conducted recently by this Bureau. The time and labor required for treating the larger herds of cattle can be greatly reduced by applying the cube-sulfur mixture with a powered sprayer. One man operating the spray nozzle can treat 8 to 10 cattle while he would be treating only one with a brush. Another economy is in the cost of materials. It is found that when sprayed under high pressure only 0.8 of an ounce is required per gallon, or 5 pounds per 100 gallons. (The hand-applied wash requires 12 ounces per gallon.) Spraying requires 50 to 70 gallons per 100 cattle, which includes 2.5 to 3.5 pounds of cube, whereas hand scrubbing requires 8.3 gallons per 100 cattle, which includes 6.2 pounds of cube. At these rates the cost of cube in spraying is about 50 percent less than with the hand-applied wash.

The Sprayer

An ordinary power-operated orchard sprayer and an ordinary tree-spraying gun are satisfactory. For good speed and effective spraying, the machine should deliver 2 gallons of spray per minute at about 250 pounds of pressure and should have a good agitator to keep the wash well mixed in the tank. The disk in the point of the nozzle should have a No. 5 opening (5/64 inch). Fifty feet of hose is usually sufficient to reach to either end of the chute. A longer hose may be used where it seems necessary to keep the noise of the machine farther from the chute. It should be remembered, however, that lengthening the hose reduces considerably the pressure at the nozzle.

The Spray Mixture

For spraying, the mixture is made up as follows:

Either derris or cube powder	- - - - -	5 pounds
Wetttable sulfur	- - - - -	10 pounds
Water	- - - - -	-100 gallons

About 1/2 gallon of the mixture is needed for effective spraying of each animal.

The cube powder and about an equal quantity of the sulfur are blended together while dry, then wetted and stirred to a muddy paste, then added directly to the water in the tank while the paddles of the agitator are running. The rest of the sulfur may be added directly to the spray tank. This procedure saves time and trouble in wetting the cube powder.

It should be remembered that this mixture is not rich enough for brush application but is to be used only with a powered sprayer.

Applying the Spray

In order to use the spray in treating the backs of cattle it is necessary that there be placed along one side of the chute about 2-1/2 feet high, or higher, as may be needed, a shelf or bench on which the operator can walk safely while directing the spray straight downward to the back of the animal. The sprayer is set to operate at 250 pounds of pressure for 50 feet of hose, or at 275 pounds if 100 feet of hose is used. With such pressure the No. 5 opening in the nozzle delivers about 2 gallons per minute. At this pressure and volume it requires about 15 seconds to spray the back of an animal, or 7 to 8 seconds for each side of the animal.

Proper adjustment of the nozzle is important. From the solid stream, or wide-open position, the nozzle is slightly closed until the stream becomes a slender cone widening to a circle of 2 to 3 inches in diameter at a distance of about 15 to 20 inches from the nozzle. Closing the nozzle farther gives a wider pattern, to be sure, but reduces the momentum required to part the hair and reach the grubs effectively. The gun is held in a vertical position with the nozzle 15 to 20 inches above the back.

The operator completes the spraying of one side of the animal before beginning on the other side. In actual practice it was found expedient to start at the front end of the animal and proceed along the back with such waving of the nozzle as the operator readily finds is required in order to reach the grub holes. Merely wetting the hair and skin is not sufficient. The spray stream must strike the back with pressure in order to dislodge the matted hair and the scabs over the grub holes. If the operator wishes to keep dry while spraying the cattle, he should wear rubber boots and a rubber apron to protect himself from the splash.

CUBE AND SULFUR APPLIED AS A DUST

Recent experiments conducted on cattle in Texas with cube and derris powders, as now supplied in the more finely ground condition, have shown that the powders mixed with wettable sulfur and applied dry are fully as effective on Texas cattle as when applied as a wash. The powder has not been found to be so effective, however, on the cattle with such extremely dense coats of hair as occur on some cattle in the North. It can be applied

more rapidly than the wash because it does not require so much rubbing. No water is required, which is an advantage for those who prefer not to wet the backs of their cattle. The wettable sulfur is an economical material for diluting the powder. With sulfur added, the powder is heavier and drifts more readily through the hair; sulfur also is thought to serve as an adhesive and preservative for the cube powder.

Materials Required for the Dust

Equal parts by weight of wettable sulfur and cube or derris powder are the only ingredients. (See pages 2 to 4 for description and sources of materials.) One pound of the dust is sufficient to treat 12 to 18 cattle. At the rate of 1 pound of the mixture for 15 cattle, the estimated cost is 1-1/3 cents per head.

Preparation and Application

The two powders are mixed thoroughly. An improvised shaker can is satisfactory for applying the dust. A tin can with 10 to 15 holes punched outward through the lid is easily prepared. The holes should be sufficiently large to permit the powder to flow from the can without vigorous shaking. Holes about 1/4 inch in diameter are the correct size. Too much shaking results in a cloud of dust, which is wasteful and becomes irritating to the nose of the worker. Holes sufficiently large permit the powder to flow out readily as the can is gently shaken along the back of the animal. One hand is rubbed gently over the dust, enough to drift it into the hair, but no deep rubbing or massaging into the hair is required.

