



CONTROL OF CATTLE WARBLER OR HEEL FLIES

Warble or heel flies, and their grubs, annually cost Canada many millions of dollars in lost production of dairy products, beef, and leather. The activities of the flies in egg laying and the injurious effects of the grubs in the flesh of the animals are responsible, in cases of heavy infestation, for as much as 10 per cent reduction in beef, and 25 per cent in milk yield. In view of the present urgent need for increased production of these vital products to fill the requirements of Canada and meet her obligations to the United Nations, it is imperative that these losses be curtailed as much as possible. Furthermore, the warble grubs, on reaching maturity, cut holes in the backs of the animals, thus ruining the value of the hides for sole leather in the manufacture of boots. The result in annual loss to Canada in leather amounts to at least one million dollars, and is especially important at the present time in view of wartime difficulties in obtaining hides for leather from abroad. It is the purpose of this pamphlet to give farmers, ranchers, and other interested persons a brief account of these injurious pests and the measures that should be taken to control them.

Warble flies are fairly large, dark, hairy flies with bands of yellow or orange which give them a resemblance to small bumble bees. There are two species of warbles which affect cattle, namely, the common cattle grub, *Hypoderma lineatum* deVill., and the northern cattle grub, *H. bovis* deG., both of which are widely distributed in many parts of the world, particularly Europe and North America. They are found in every part of Canada where stock is raised and, wherever abundant, are the worst insect pest of cattle. The grubs can also develop in the American buffalo, but cattle are the normal host. Occasionally other animals such as horses and goats are attacked, but it is probable that in such cases most of the grubs die before reaching maturity.

Life-History and Habits

The flies of the common cattle grub appear early in the season from March to June, while the flies of the northern cattle grub are active from early June until August. In both species each female lays from 400 to 800 eggs. The eggs are laid during bright, sunny days on the hair of the legs and lower parts of the cattle. The small grubs hatch out in from three to seven days, penetrate the skin, migrate through the system of the animal, and in some cases collect in large numbers in the region of the gullet. They remain there during the late summer and until early winter, when they again migrate, and finally come to rest under the skin of the back. Here the grubs form cysts and cut breathing holes in the skin. After about six weeks, more or less, in this position, the full-grown grubs squeeze their way through the breathing holes and drop to

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the ground. This is usually in late winter or early spring. They seek protection under debris or loose soil and change into black, hard, seed-like objects (pupae) about three-quarters of an inch in length from which, after a month or longer, the flies emerge. The flies do not feed, but exist during their short winged life on food reserves stored up in their bodies during the grub stage. The flies mate shortly after emerging, and then egg-laying may commence immediately.

From the foregoing it will be seen that the total time taken by the species in passing through the life-cycle from egg to egg-laying fly is about a year, and of this at least nine months are spent as a grub within the body of the host animal. Although the life of the individual fly is only about a week, the period during which the flies may be on the wing is five months or more, as there is a continual succession of flies emerging from spring until August.

Injury Done by Warble Flies

Warble flies cause losses in several ways. When the flies are egg-laying, cattle often become terrified and with upraised tails and terror-stricken eyes, run from their small tormentors. Although the flies are unable to inflict pain, the buzz they make is sufficient to cause the cattle to rush madly about in vain efforts to evade them. This results in reduction of the milk yield of dairy cattle and loss of flesh in beef animals. It may also result in physical injury. Range-cattle owners find that their animals often become unmanageable when heel flies are about.

The presence of the grubs in the bodies of cattle causes them to become unthrifty. Beef animals do not fatten or put on finish well while infested. A further loss is the wastage of meat due to the presence of warble cysts in beef carcasses. The affected portions, known as "licked beef", must be trimmed from the carcass, and, as they occur usually in the more expensive cuts in the back and loin, the loss and disfigurement is considerable. Dairywomen are generally agreed that milk production is reduced during the time milch cows are heavily infested with grubs in the back.

Injury to hides by warbles results in annual losses probably exceeding a million dollars. The damage consists of holes and scar tissue, and is very conspicuous in the tanned leather. When the holes are numerous the hide is useless for most commercial purposes. Affected hides are docked from one to two cents per pound even if only a few holes are present (hides showing 5 or more grub holes are graded No. 2): this often means a decrease of one dollar a hide.

Losses from all causes attributable to warble flies in Canada may reach as high as \$14,000,000 annually.

Control

The most satisfactory method of control involves destroying the grubs after they reach the backs of the animals. However, reduction of warble damage may be effected to some extent by housing cattle during the daytime or providing them with darkened sheds or brush shelters in which they can find refuge from the flies. Access to sloughs and shallow bodies of water also provides some protection, as the flies do not appear to molest animals standing in water.

Range management can assist in warble control. The organization of the ranches should be such that the summer ranges are as far as possible from the winter ranges. It was found in British Columbia that when range cattle were moved back to higher ranges as the lower ones dried up, any grubs that were dropped were left behind and, as the flies travel only short distances, the cattle escaped infestation from those that subsequently emerged. Another good practice is, where possible, to arrange the summer and winter ranges so that they are separated by some natural barrier such as a river or wooded region. Holding the stock as late as possible on the winter range and moving the herd at night to the summer range to prevent the flies from following has been suggested as of value.

Warble flies are most easily destroyed in the grub stage after having reached the backs of cattle. Hand extraction of the grubs has given good results where systematically undertaken. In the case of soft-skinned breeds as Jerseys and Guernseys, squeezing out grubs by slow downward pressure of the fingers around the cysts is not a particularly difficult matter, but with tough-skinned animals, such as Holsteins, or cattle which are very fat or very thin, it is laborious.

Rotenone Wash.—An easier method is to kill the grubs in the backs of cattle by the application of a wash containing derris or cubé powder. This powder is made from the ground-up roots of certain species of tropical plants and contains a potent insecticide called rotenone. There are several commercial preparations registered under the Pest Control Products Act available for making the warble wash. These contain sufficient ground root to provide a wash with a rotenone content of not less than 0.23 per cent (when used according to directions), plus other insecticidal extractives naturally present in the root. They also contain a wetting agent such as neutral soap powder or wettable sulphur. For those who would like to make up their own powder and are able to obtain the required ingredients, it may be stated that $\frac{1}{2}$ pound of derris or cubé powder (containing 5 per cent rotenone) and $2\frac{1}{2}$ ounces of neutral soap powder, or, 7 ounces of wettable sulphur, are sufficient to make one imperial gallon of wash.

The prepared powder when mixed with water is ready for use. The procedure to follow is to put the powder into a bucket, pour in a little water and mix to a paste: then add water slowly while stirring to make up the required quantity according to directions. If the powder contains wettable sulphur, either hard or soft water is satisfactory, but if soap is the ingredient, soft water, such as rain water, is preferable. To help dissolve the soap quickly, the water, if possible, should be warm. It is advisable to prepare only sufficient wash for immediate use.

The wash may be applied to the backs of the animals from a jar with a sprinkler top, or a bottle of convenient size (a 40-ounce bottle would do) and should be distributed and rubbed in vigorously with a stiff brush to penetrate the hair and remove scabs from the grub holes. Do not use a wire brush, and do not scrub too hard and rupture the warbles. The fingers may be used to ensure that every warble is reached and thoroughly wetted with the wash. The brush can be freed of matted hair and kept in good working condition by a few strokes up and down a board into which many nails have been driven at a slant. It is important to stir the wash frequently. This should be done each time a jar or bottle is filled from the bucket. When a lot of animals have to be treated, it may be quicker to dip the brush directly into the wash in the bucket and then rub it on the backs.

The first application of the wash should be made when the mature grubs in the backs of the cattle become dark in colour. This may be determined by squeezing out a few of the larger warbles. The date varies in different parts of Canada, and from year to year. It may be as early as mid-February in British Columbia, and about the third week in March in the Prairie Provinces and Eastern Canada, with local variations depending on regional and seasonal conditions. Second and third treatments should be made at 30-day intervals thereafter, to kill the grubs that continue to arrive in the animals' backs. If practicable, a fourth treatment may be given after a further interval of 35 days. However, if it is not feasible, for instance, in the case of cattle on the range, to apply the full schedule of treatments, two, or even one, applications of the wash will greatly reduce the infestation and improve the health and condition of the animals.

An objection of many owners of range cattle to treating their herds in early spring is that passing the cattle through a chute endangers the calf crop.

Experience in British Columbia indicates that these fears are unfounded. A squeeze, however, should not be used. Ice is a more serious menace, but the danger to stock from slipping may largely be overcome by sanding the yards. As the old cows are seldom as severely infested as younger stock, it might be practical to give such animals only one treatment, just before the cows and calves are moved to the summer ranges.

Rotenone Spray.—For treating large herds, a power sprayer, where available, is a great labour saver. The mixture for spraying, recommended by the United States Bureau of Entomology, consists of derris or cubé powder (5 per cent rotenone) 5 pounds, wettable sulphur 10 pounds, water 80 imperial gallons. An ordinary power-operated orchard sprayer and a tree-spraying gun are satisfactory for applying this spray. The machine should be equipped with a good agitator to keep the wash well mixed, and should be capable of delivering two gallons of spray per minute at a pressure of about 250 pounds. The disk in the nozzle should have a No. 5 opening ($\frac{5}{16}$ inch). The hose should be long enough to reach both ends of the chute.

The rotenone powder and sulphur are mixed dry in about equal quantities, then wetted and stirred to a paste and added to the water in the spray tank with the agitator working. The remainder of the sulphur is then mixed in.

The operator applies the spray from a shelf or bench 2-3 feet high placed along one side of the chute, directing it straight downward on to the backs of the animals. The force of the spray should strike the back with pressure sufficient to dislodge the matted hair and the scabs over the grub holes. With the sprayer operating at 250 pounds pressure, the nozzle should be slightly closed so that the stream becomes a slender cone widening to a circle 2-3 inches in diameter at the point of contact 15-20 inches from the nozzle. One hundred gallons of spray is sufficient to treat about 200 cattle.

Rotenone Dust.—A dry mixture of equal parts of wettable sulphur and derris or cubé powder (5 per cent rotenone) was found to be effective against cattle warbles in experiments conducted in Texas. The mixture may be distributed on the backs of the animals by means of a tin can with 10-15 quarter-inch holes punched in the lid. This allows the powder to flow out readily as the can is gently shaken, without raising an irritating and wasteful cloud of dust. While doing this, one hand is rubbed over the dust to work it into the hair. The United States Bureau of Entomology estimates that one pound of powder is sufficient to treat from 12 to 18 cattle. The powder saves wetting the backs of the animals, which may be an advantage in cold weather, and is more rapidly applied than a wash. However, it was not found to be so effective on cattle with very dense coats of hair as on short-haired cattle in the south.

Substitute Materials.—Unfortunately, supplies of the rotenone-bearing roots used in warble preparations are much less plentiful than they used to be, because a considerable portion of them came from Malaya and the Dutch East Indies and, at present, are no longer available. It is hoped that there will be enough to take care of the requirements for warble control, but if shortages occur, substitute materials, or measures such as removing the grubs by hand, as already described, may have to be used. Investigations with a view to finding suitable substitutes for rotenone are under way. If shortages of the rotenone wash develop before the results of this work are available, stock owners may use either benzol or an ointment prepared by thoroughly mixing together pyrethrum powder, 1 part; petrolatum, 2 parts. The benzol is applied by injecting a small quantity into the openings of the warble cysts by means of an oil can. The pyrethrum ointment is simply pressed into each grub hole with the fingers. The same schedule of treatments should be followed as when a wash is used.

Division of Entomology, Science Service, Department of Agriculture, Ottawa.

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