



Tests of Insecticides for the Control of Goat Lice in 1957 and 1958¹

BOBBY MOORE, R. O. DRUMMOND, and H. M. BRUNDRETT, *Entomology Research Division, Agric. Res. Serv., U.S.D.A.*

ABSTRACT

To investigate reports on resistance of goat biting lice (*Bovicola caprae* (Gurlt) and *B. limbatus* (Gerv.)) to chlorinated hydrocarbon insecticides, goats from two ranches near Kerrville, Texas, were dipped into insecticides at dosages recommended by the Entomology Research Division, U. S. Department of Agriculture. Lice from one ranch were not killed by 0.25% toxaphene, which previously had been very effective. Field tests were conducted with sprays of Delnav[®] (2,3-*p*-dioxanedithiol *S,S*-bis(*O,O*-diethyl phosphorodithioate)), ronnel, malathion, Diptex[®] (*O,O*-dimethyl 2,2,2-trichloro-1-hydroxyethylphosphon-

ate), Bayer 21/199 (*O*-(3-chloro-4-methylumbelliferone) *O,O*-diethyl phosphorothioate), Sevin[®] (1-naphthyl *N*-methyl carbamate), and toxaphene for the control of biting lice and sucking lice (*Linognathus stenopsis* (Burm.)). Toxaphene and 0.1% Delnav failed to kill lice. Others were effective within 24 hours on goats with fleece shorter than 10 weeks' growth, and from 3 to 5 days on goats with longer fleece. Flocks sprayed with 0.5% ronnel, 0.1% Bayer 21/199, and 0.5% Sevin were free of lice at the next shearing (2 to 4 months).

Angora goats raised in the Edwards Plateau area of southwestern Texas are commonly infested by three species of lice—the goat biting louse (*Bovicola caprae* (Gurlt)), the Angora goat biting louse (*B. limbatus* (Gerv.)), and the goat sucking louse (*Linognathus stenopsis* (Burm.)). Heavy infestations lower the vitality of the goats and reduce the quality and quantity of mohair.

Early recommendations by Babcock (1936) for the control of goat lice consisted of arsenic, coal-tar creosote, nicotine, and sulfur dips. Babcock (1944) and Parish & Rude (1946) reported that dips containing 0.2% of DDT were effective on freshly sheared goats or goats in full fleece. More recently Smith & Richards (1955) have shown that a number of chlorinated hydrocarbon and organic-phosphorus insecticides are effective against goat lice.

In 1957 reports began reaching the Kerrville laboratory that ranchers were not obtaining satisfactory control with sprays or dips of toxaphene, one of the most widely used insecticides for goat louse control. Studies were therefore undertaken to determine whether the lice had become resistant to toxaphene and to evaluate the effectiveness of newer insecticides against lice from problem ranches. The results of tests conducted in 1957 and 1958 are presented herein.

PRELIMINARY TESTS.—Precise evaluation of an insecticide is seldom feasible under field conditions, especially where resistance is suspected. Therefore, 40 goats heavily infested with biting lice from each of two ranches where toxaphene treatments reportedly had failed were moved to the laboratory so that they could be treated, isolated in groups, and examined individually at prescribed intervals.

Four dips were tested on 10 goats from each ranch—two toxaphene formulations, DDT, and a mixture of toxaphene and lindane on those from ranch 1; and toxaphene, DDT, methoxychlor, and lindane on those from ranch 2.

Each goat was completely submerged in a 50-gallon portable vat. After treatment each group was isolated in a separate pen to avoid contamination between treatments. The goats were examined for lice before treatment and several times afterwards, for 3 weeks. Any louse able to move legs or antennae was considered alive and the

Table 1.—Relative effectiveness of dips of several chlorinated hydrocarbon insecticides for control of goat biting lice (10 goats per treatment).

INSECTICIDE ^a	PER CENT CONCENTRATION	NUMBER OF GOATS INFESTED AFTER				
		1 Day	2 Days	1 Week	2 Weeks	3 Weeks
<i>Ranch 1</i>						
Toxaphene (L)	0.25	1	7	0	0	0
Toxaphene (C)	.25	10	10	4	0	0
DDT (L)	.25	1	0	0	0	0
Toxaphene+lindane (C)	.09+.004	10	8	3	1	0
<i>Ranch 2</i>						
Toxaphene (C)	0.25	10	10	10	10	10
DDT (L)	.25	10	2	0	0	0
Methoxychlor (L)	.5	7	0	0	0	0
Lindane (L)	.025	10	2	0	7	10

^a L indicates laboratory formulations and C commercial formulations.

goat recorded as infested. Results of these tests are summarized in table 1.

In the tests with goats from ranch 1 all insecticides were effective. DDT gave 100% kill in 48 hours, but the other materials required 1 to 2 weeks.

Lice on goats from ranch 2 were eradicated by the DDT and methoxychlor dips. Lindane gave excellent immediate control but reinfestations developed in 3 weeks, indicating a lack of residual effectiveness. Toxaphene provided very little control, indicating that the lice were resistant to this insecticide.

FIELD TESTS.—Extensive field tests were then conducted to evaluate the effectiveness of toxaphene and six other insecticides as sprays for the control of goat lice. These tests involved 23 flocks, totaling more than 6,000 animals. Flocks with different lengths of fleece were chosen. All flocks were heavily infested with biting lice but only one with sucking lice.

The insecticides used were Delnav[®] (2,3-*p*-dioxanedithiol *S,S*-bis(*O,O*-diethyl phosphorodithioate), Diptex[®] (*O,O*-dimethyl 2,2,2-trichloro-1-hydroxyethylphosphonate), Bayer 21/199 (*O*-(3-chloro-4-methylumbelliferone) *O,O*-diethyl phosphorothioate), Sevin[®] (1-naphthyl *N*-methyl carbamate), ronnel [Korlan grade], malathion, and toxaphene. The concentrations ranged from 0.1 to 0.5%, depending upon toxicity to animals and effectiveness in preliminary or screening tests.

¹ Accepted for publication April 20, 1959.

Table 2.—Effectiveness of seven insecticide sprays for the control of goat biting lice in field tests.

INSECTICIDE AND PER CENT CONCENTRATION	GALLONS USED	ANIMALS TREATED	TIME SINCE SHEARING	DAYS BEFORE COMPLETE KILL
Ronnel (25 WP)				
0.25	40	193	1 mo.	1
	150	594	2½ mo.	5-7
	75	280	Shorn	1
0.5	50	253	6 wk.	1
	100	394	5 wk.	1 ^a
	100	422	Shorn	1
Delnav (30 EC)				
0.1	50	236	1 mo.	Incomplete ^b
	85	273	6 wk.	Incomplete
0.15	75	250	2 wk.	1
0.2	40	176	Shorn	1
Malathion (25 WP)				
0.1	100	220	Shorn	1
0.5	120	436	2 mo.	2-4
Dipterex (50 SP)				
0.15	50	184	2 wk.	1
0.25	125	545	2 wk.	1
	50	224	1 mo.	1
Bayer 21/199 (25 WP)				
0.1	50	227	1 mo.	1 ^a
0.25	45	170	2 mo.	1
	45	169	2 mo.	1
	50	225	Shorn	1
	125	420	5 mo.	2-4
Toxaphene (50 EC)				
0.5	110	436	2 mo.	Incomplete ^b
Sevin (50 WP)				
0.25	100	511	2 wk.	1
0.5	125	460	5 mo.	5-7 ^a

^a Complete kill also at next shearing.

^b Re-treated.

The insecticides were applied with a power sprayer at a pressure of 250 to 300 pounds per square inch. Each animal was treated with approximately 1 quart of spray. This amount was more than enough to wet thoroughly freshly shorn goats, but the degree of wetting of others varied with the length and density of the hair. Goats were sprayed in small groups to insure that each animal was treated.

Goats were examined for lice before treatment, after 24 hours, and at various intervals thereafter. Three

flocks were examined at the next shearing, 2 to 4 months after treatment.

RESULTS.—Results of these tests are summarized in table 2. Bayer 21/199 and malathion at 0.1%, Delnav and Dipterex at 0.15% and Sevin and ronnel at 0.25% all gave complete kill in 1 day on goats freshly shorn or with 2 to 6 weeks' growth of hair. Control on goats with 2 to 5 months' growth of hair was somewhat slower, from 3 to 5 days, with the same or higher concentrations of insecticide. An application of 0.25% ronnel to the one flock infested with sucking and biting lice apparently gave complete control of the latter in 1 day, but 4 days were required for the sucking lice (data not shown in table). The standard treatment of 0.5% toxaphene failed to give satisfactory control in 5 to 7 days and the flock was retreated with malathion.

In a test with 0.2% Delnav, nannies were treated and after 4 hours returned to pens where their kids had been held. Subsequent observations showed that the nannies were free of lice but populations on the kids were not controlled. It was therefore indicated that control cannot be achieved without treating all the animals in a flock.

Three flocks that had been treated with 0.5% ronnel, 0.1% Bayer 21/199, or 0.5% Sevin were examined at the next shearing to ascertain whether the treatments had eradicated lice. All were free of lice.

REFERENCES CITED

- Babcock, O. G. 1936. Sulfur dips for the control of goat lice. U. S. Bur. Ent. and Plant Quar. E-394.
- Babcock, O. G. 1944. DDT for the control of goat lice. Jour. Econ. Ent. 37(1): 138.
- Parish, H. E., and C. S. Rude. 1946. DDT for the control of goat lice. Jour. Econ. Ent. 38(5): 612.
- Smith, C. L., and Rowland Richards. 1955. Evaluations of some new insecticides against lice on livestock and poultry. Jour. Econ. Ent. 48(5): 566-8.