SOME COMPARATIVE TESTS OF FLY SPRAYS, FLY REPELLENTS, AND THE INSECT ELECTROCUTOR AS A MEANS OF CONTROL OF THE COMMON FLIES ON DAIRY CATTLE IN THE COLLEGE DAIRY BARN

by

WILLARD VIRGIL REDDING

B. S., Kansas State College
of Agriculture and Applied Science, 1931

A THESIS

submitted in partial fulfillment of the

requirements for the degree of

MASTER OF SCIENCE

KANSAS STATE COLLEGE
OF AGRICULTURE AND APPLIED SCIENCE

1933

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INTRODUCTION

The fly problem in dairy barns is one in which all progressive dairymen are interested because of the manifold effects on the industry.

There are three species of flies throughout the United States which have to be dealt with around dairy barns. They are the stable fly (Stomoxys calcitrans Linn.), the horn fly (Haematobia irritans Linn.), and the house fly (Musca domestica Linn.).

The house fly because of the structure of its mouthparts cannot bite animals, however, they make the cows nervous by crawling over them and feeding on the body secretions. It breeds in decaying vegetable matter or in accumulations of horse manure. They have numerous filthy habits such as crawling in the gutter, feed troughs, and dairy utensils.

The stable fly resembles the house fly in size and color, but it is somewhat more robust and is provided with a long piercing beak which is used in sucking the blood of the animals. This fly breeds in accumulations of manure and in moist hay or straw around the feed lot. It has the habit of feeding on the back of the forelegs of dairy cows. It feeds, then goes to the wall of the barn to digest its food, after which it returns for another meal.

The horn fly is the smallest of the three flies mentioned. It is also provided with a small piercing beak used in sucking the blood of the animal. It feeds more commonly at the base of the horn or on the shoulders of the animal. This fly will feed and digest its food on the animal. It breeds entirely in fresh cow manure around the barn and in the pastures.

At the present time there are many kinds of fly sprays, electric screens, box traps, and other commercial materials and devices sold to farmers and dairymen with the idea that they will receive great benefit by keeping flies under control.

The objects in performing these tests were:

1. To find out the actual value of some fly sprays, repellents, and traps.

2. To find the length of time a spray will repel flies.

3. To find if their application will increase the body temperature.

4. To find a spray or sprays that would be economical for the farmer to use and make.

5. To find out if the relative humidity of the atmosphere has any appreciable effect on the number of flies found on dairy cows before spraying.

6. To find out if the spraying will aid in increasing or maintaining milk production.

7. To find out by actual count if black colored animals have more flies on them than white ones.

8. To find some good baits for traps, and the efficiency of an electric fly trap in the College dairy barn.

9. To find out if flies temporarily paralyzed by the fly spray eventually die.

10. To determine by the fly counts before spraying whether the air temperature has any appreciable effect on the number of flies on dairy cows.

REVIEW OF LITERATURE

Beach and Clark (1904) and Eckles (1905) reported trials in which they sprayed certain cattle with proprietary sprays and found that the sprayed cattle did not give an increased amount of milk over the unsprayed cattle.

Cory (1916) reported tests in which dairy cattle were sprayed with a pine tar creosote emulsion and found that there was an average increase of three pounds of milk per animal over a 10 day spray period. He also found that a 3 per cent pine tar creosote emulsion killed all the flies that were covered by the spray. The cost of spraying under these conditions was less than one-half cent per cow per application. His results are open to experimental error because he selected the cows at random instead of on the basis of milk production, breed, and body weight.

Lush and Cave (1925) conducted a number of tests on the College dairy herd using five commercial fly sprays and found that the sprayed lots increased from .22 to 4.07 per cent in milk flow, while the check lot gave only a .41 per cent increase. The reduction in the number of flies was very significant.

Freeborn, Regan, and Folger (1925) reported tests under controlled conditions regarding the effect of fly sprays on milk production. They found that high producing dairy cows exposed to a heavy infestation of flies showed a slight loss in production and that the application of commercial fly sprays with a petroleum oil base caused a further reduction. During one month's confinement in a heavy infestation of horn flies, the loss in milk production was 1.4 per cent, with house flies 3.33 per cent, and with stable flies 9.26 per cent. When the cows were sprayed with a pyrethrum extract spray having a petroleum oil base the control animals lost 4.3 per cent, while the spray lot which was infested with stable flies lost 12.4 per cent in milk production.

Cleveland (1926) reported on a group of fly repellent experiments conducted in 1924 and 1925 under practical farm conditions. He concluded that cows regularly sprayed with the most effective, odorous repellents exhibited a high degree of protection from the stable and horn flies in com-

parison with the unsprayed animals; and that the sprayed cows were not as nervous as the unsprayed. Of all the repellents tested, he concluded that crank case oil and oil of tar in proportions of one gallon to one pint, offered the most promising results from the standpoint of effectiveness, cost, and practicability.

Lush and Cave (1928) conducted a second series of fly spray tests using two commercial sprays on the College dairy herd. They found that the sprays tested would only repel flies for short periods of from one-half hour to one hour and that the spray lot lost 1.06 per cent more in milk production than the check lot.

Freeborn, Regan, and Folger (1928) conducted a second series of fly spray tests to check the data gathered in 1925. They found that exceedingly heavy infestations of Musca domestica Linn. did not result in lowered milk production, whereas the spraying with oil caused a 9.7 per cent loss, pine tar creosote a 6.9 per cent loss, and water alone caused a 5.4 per cent loss. The body temperature was consistently higher in the oil sprayed group than for the controls and that the respiration rate of the former group averaged 40 per cent higher than that of the latter. After two years of this work Freeborn made the following statement, "Any spray which will repel more than 80 per cent of the flies over a 24 hour period without injuring

the coat of skin and without tainting the milk, is a decidedly valuable adjunct; providing its application does not decrease the milk flow."

Lush and Cave (1930) conducted a third series of fly spray tests at the College. They found that the flies were greatly reduced on the cows in all spray groups during the first half hour after spraying and that milk production of the check lots was 1.06 per cent better than in the sprayed lots.

Melvin (1932) reported on a series of physiological studies of flies and fly sprays on cattle during 1928-1930 inclusive. He found that when both high producing cows and heifers were used in a series of experiments with oils, in the shade and in the sun under various air temperatures, that the oil sprays under certain conditions caused not only an increase of the body temperatures but also an increase in respiratory movements. Some of the sprayed animals ran a temperature of 110 degrees F., in comparison to 102.5 degrees F. for the controls. It was necessary to discontinue this experiment to keep the animals from dying. He also noticed that stable flies caused a rise in body temperatures and respiratory rates of both heifers and high producing cows.

Gnadinger and Corl (1931) reported that an oil solution of rotenone was considerably less toxic to flies than a

pyrethrin solution of the same concentration. This probably accounts for the greater amount of fly sprays with an oil base having the pyrethrin as the killing agent.

Wells (1931) in his observations of electrified screens and traps found that for the destruction of house flies and blow flies, electric traps were fairly efficient but needed further improvement. He states that all the flies that passed through the electric traps or screens were not killed, some being apparently uninjured. He also noticed that electric screens in some windows were good destroyers of flies without a bait being used.

Bishopp (1932) reported that fly sprays should not be depended upon to solve the fly problem, but they may be used to supplement preventive measures. He suggested that conical traps be put in convenient places in the barn for trapping flies and that all milk rooms should be screened. He also suggested that the breeding places, especially the manure accumulations in the barn lot, be eliminated.

Pearson, Wilson, and Richardson (1933) report that some methods of testing cattle fly sprays for repellent efficiency on the stable fly, are unsatisfactory. Their results show that close individual observations of relatively few cows of known fly susceptibility gave more consistent and dependable results than less accurate observations on a large number of cows.

COMPARATIVE TESTS OF FLY SPRAYS AND FLY REPELLENTS

Methods of Testing

These tests were conducted in the College dairy barn. In 1932 the dairy cows of the following breeds were used: Holsteins, Ayrshires, Guernseys, and Jerseys. The cows were grouped according to stage of lactation, daily milk production, and body color. Eight cows were used for each 15 day spray period, 4 as a spray lot, and 4 as a check lot. The cow-test-week in all of these experiments was considered as 5 days, during which time the cows of the spray group are sprayed. They were allowed to rest 5 days, then they were sprayed a second 5 day period. On the first day of each rest period the cows in the spray lot were washed with soap and water to remove oily residues and dirt.

In 1932 the spray schedule was conducted from 4-6 a.m. and 3-5 p.m. for the Palustrex-soap solution test and from 3-5 p.m. for the Superla insect spray oil test. A small hand sprayer was used to apply the spray on the cows. The body temperatures were taken by means of a veterinary clinical thermometer and the air temperatures were taken by an ordinary Fahrenheit thermometer. The spray materials were measured with a graduated cylinder. In these spray tests all counts of flies were made on the left side of the animal's body. These counts were made every 30 minutes for

one and one-half hours after spraying.

In 1933 the methods of testing were the same as those used in 1932 except the relative humidity was obtained through the use of a Tycos hygrometer. The cows used were of the Guernsey and Jersey breeds. The cows were grouped according to their body weight and average milk production for a 5 day period previous to spraying. The fly counts were made for 2 hour periods. Before spraying and thirty minutes after spraying, the tail switches were counted for one minute periods. During this season the check lot was sprayed with tap water using a separate sprayer.

Experimental Data and Tables. The data recorded in table I show that when Superla insect spray oil was sprayed on the animals a large percentage of the flies were killed and a number were repelled for periods of one and one-half hours after spraying. The body temperatures of the sprayed animals was about normal, therefore, it appears that no ill effects of the spray were noticed. It was noticed that the spray lot did not switch their tails as much as the check lot during either week, showing that they were more contented. During both test weeks the check lot showed a slight advantage in milk production. In no case did the milk absorb the odor of the spray used. The cost of spraying four cows for one test week under these conditions was

Table I. Comparative Test of Spraying Superla Insect Spray Oil (A Pyrethrum-Petroleum Extract) Once Daily Against Flies on Dairy Cattle in the College Dairy Barn

Cow Lot	1932	Number of flies on left side of body: Before spraying	After spraying: ½ hr.	After spraying: 1 hr.	After spraying: 1½ hrs.	No. tail switches in 3 minute periods ½ hr. after spraying	Body temperature, degrees F.: Before	Body temperature, degrees F.: After	Date	Temperature, degrees F.	P.M. Milk Production: Previous week Daily lbs.	P.M. Milk Production: Actual Daily lbs.	Gain	Loss
Averages for one test week (five days). Time, 3:00-5:00 P.M.														
Spray A	6-20 to													
Cow No. 1	6-24	39.2	2.2	3.8	5	5.8	101.33	101.22	June 20	78	5.3	6.18		.88
2		49.2	3.6	6	3.6	5.2	101.44	101.30	21	82	7.14	6.60	.54	
3		38.6	2.6	5.8	7.2	3.8	102.34	102.16	22	88	8.00	7.50	.50	
4		37.4	3.6	5	5.4	4.8	101.30	101.31	23	88	8.38	7.86	.52	
Av. Lot A		41.10	3.0	5.15	5.30	4.9	101.60	101.49	24	80	7.21	7.06	.68	
Check B	6-20 to													
5	6-24	37.8	35.2	30	43.4	7.4	101.19	101.19			10.48	9.46	1.02	
6		89.6	94	105.2	110.6	25.4	100.94	100.98			9.76	7.26	2.50	
7		26.8	43	36.8	40.4	9.2	101.33	100.82			8.56	9.10		.54
8		40	52	57.2	61.8	14.2	102.43	102.16			9.98	11.34		1.36
Av. Lot B		48.55	56.05	57.30	64.05	14.05	101.47	101.29			9.69	9.29	1.60	
Difference A-B		7.45	+53.05	+52.15	+58.65	+ 9.15	-0.13	-0.20						
Spray A	6-30 to													
Cow No. 1	7- 4	32	3.6	5	5	7.2	102.00	101.68	June 30	90	4.60	5.22		.62
2									July					
2		39.9	3.4	2.8	6	6.8	101.74	101.28	1	83	5.70	6.44		.74
3		39	4.8	5	6.4	5.2	103.28	102.58	2	84	5.88	7.82		1.94
4		35.4	3.6	4.8	6.4	7.4	102.30	101.96	3	89	8.36	8.14	.22	
Av. Lot A		36.6	3.85	4.4	5.95	6.45	102.33	101.87	4	92	6.135	6.90		3.08
Check B	6-30 to													
5	7- 4	32	32.2	20.6	23	24.4	101.60	101.29			9.88	9.66	.22	
6		90.2	99	86	84	32.6	101.57	101.09			7.16	9.16		2.00
7		29.4	37.4	56.2	27.6	12	101.42	101.16			7.60	8.26		.66
8		33.8	37.8	47.8	39.8	16	102.35	102.26			8.98	9.38		.30
Av. Lot B		46.4	51.6	51.4	43.6	21.25	101.73	101.45			8.405	9.125		2.74
Difference A-B		9.8	+47.75	+47	+37.65	+14.80	-0.60	-0.42						

+ indicates advantage to spray lot.
- indicates advantage to check lot.

$0.0404 or approximately two-fifths of a cent daily for one afternoon spraying.

The concentration of Palustrex-soap solution was raised from 75 cc. of Palustrex to one quart of medium soap solution to 125 cc. of Palustrex per quart.

The data recorded in table II show that when Palustrex-soap solution was sprayed on the animals, it repelled flies efficiently for periods of one hour after spraying. The body temperatures of the sprayed group was slightly below normal in some cases, therefore, there was no rise in body temperatures. It was also noticed that the spray lot did not switch their tails as much as the check lot, showing that they were more contented. During both test weeks the check lot showed a slight advantage in their milk production over that of the previous week, therefore the advantage was in favor of the check lot. The cost of spraying four cows for one test week under these conditions was $0.1011 or a cost of $0.0202 a day.

The concentration of Palustrex-soap solution was raised from 125 cc. of Palustrex to one quart of medium soap solution to 350 cc. of Palustrex per quart.

The data recorded in table III show that when Palustrex-soap solution was sprayed on the animals it repelled flies efficiently for one and one-half hours of a two hour spray period. The body temperatures of the spray lot were

Table II. Comparative Tests of Spraying Palustrex-Soap Solution (A Pine Tar Product in Combination with Ivory Soap) Twice Daily Against Flies on Dairy Cattle in the College Dairy Barn.

Cow Lot	1932	Number of flies on left side of body: Before spraying	After spraying: ½ hr.	After spraying: 1 hr.	After spraying: 1½ hrs.	No. tail switches in 3 minute periods ½ hr. after spraying	Body temperature, degrees F.: Before Spraying	Body temperature, degrees F.: After Spraying	Date	Temperature degrees F.	P.M. Milk Production: Previous week Lbs. Daily	Present week lbs. daily	Actual Gain	Actual Loss
Averages for one test week (five days) only. Time, 4:00-6:00 A.M.														
Spray C	7- 6 to													
Cow No. 1	7-10	20.00	4	7.20	7.60	4.40	100.74	101.04	July 6	76	8.48	8.42	.06	
2		18.20	4.20	7.40	8.60	5	101.18	100.95	7	80	4.94	5.44		.50
3		14.00	5.00	5.40	8.80	2.40	100.74	100.90	8	78	5.64	6.24		.60
4		13.80	5.40	5.80	5.60	2.20	101.24	101.30	9	81	5.42	5.94		.52
Av. Lot C		16.50	4.65	6.45	7.65	3.50	100.98	101.05	10	82	6.12	6.51		1.56
Check D	7- 6 to													
5	7-10	25.80	21.40	25.60	23.80	8	100.72	100.98			8.34	8.54		.20
6		20.00	18.80	18.00	17.40	7.60	100.93	100.76			8.36	8.42		.06
7		54.80	45.60	36.40	40.60	20.80	100.56	100.62			7.76	7.52	.24	
8		30.80	26.40	23.40	26.80	15.60	101.33	101.19			10.56	9.80	.76	
Av. Lot D		33.10	28.05	25.85	27.15	13.00	100.89	100.88			8.75	8.57	.74	
Difference C-D		16.60	+23.40	+19.40	+19.50	+9,50	-0.09	-0.17			-2.63	-2.06		
Averages for one test week (five days) only. Time, 3:00-5:00 P.M.														
Spray C	7- 6 to													
Cow No. 1	7-10	21.40	10.20	17.20	19.40	3.20	101.68	101.05	6	88	8.18	8.66		.48
2		23.80	10.00	15.00	12.20	3.60	101.55	101.27	7	88	6.08	6.04	.04	
3		14.60	5.80	7.20	9.60	5.60	101.26	101.20	8	86	6.38	6.44		.06
4		25.40	10.00	13.60	12.40	5.80	101.57	101.31	9	93	6.62	6.88		.26
Av. Lot C		21.31	9.00	13.25	13.40	4.55	101.52	101.21	10	90	6.81	7.00		.96
Check D	7- 6 to													
5	7-10	25.00	37	32.20	28.00	12.20	102.76	102.31			9.08	8.94	.14	
6		28.20	34.20	32.00	31.60	6.60	101.18	101.00			8.82	8.66	.16	
7		72.80	92.40	100.80	73.40	26.60	101.65	101.35			7.54	6.74	.80	
8		30.40	36.00	32.00	33.20	23.40	101.25	101.38			10.40	9.84	.56	
Av. Lot D		34.10	49.90	50.25	41.55	17.20	101.71	101.51			8.96	8.54	1.66	
Difference C-D		12.80	+40.90	+37.00	+28.15	+12.65	+0.19	+0.30			-2.15	-1.54		

+indicates advantage to spray lot.
-indicates advantage to check lot.

Table III. Comparative Tests of Spraying Palustrex-Soap Solution (A Fly Repellent)

Once Daily Against Flies on Dairy Cattle in the College Dairy Barn

Cow Lot	1933	Before spraying	Number of flies on left side of body: After spraying: ½ hr.	1 hr.	1½ hrs.	2 hrs.	Number of tail switches in 1 minute periods: Spraying: Before	½ hr. after	Body temperature, degrees F.: Spraying: Before	After	Atmospheric conditions 3:00-4:00 p.m.: Date	°F.	Per cent relative humidity	Afternoon milk production: Previous week pounds daily	Actual average: Gain	Loss
Averages for one test week (five days). Time, 3:00-5:00 P.M.																
Spray E	6-12 to 6-16	35	8.2	11.8	20.8	26	7.2	2.8	101.36	101.08	June 12	80	38	9.44	8.42	1.02
Cow No. 1		39	12.2	17.6	25.6	30.4	11.2	5.8	100.94	100.94	13	78	40	7.58	7.98	.40
2		26.6	11.6	18	20.2	27.2	7.6	3.2	101.16	101.50	14	80	38	4.28	4.84	.56
3		44	13	15.4	26.8	29.6	9	2.6	101.18	101.32	15	85	33	10.30	10.10	.20
4		35.9	11.25	15.7	23.325	28.3	8.75	3.6	101.16	101.21	16	87	32	7.9	7.835	+0.26
Av. Lot E																
Check F	6-12 to 6-16	30.6	37	38.6	34.8	42.8	5.8	8	101.26	101.48				4.64	5.32	.68
5		33.6	38.8	42.2	39.6	39.8	11.4	11.6	100.84	101.08				6.70	7.62	.92
6		25.6	28.4	27	28.6	35.2	11	10.8	101.24	101.34				6.54	6.12	.42
7		19.2	19	21.8	28.6	26	10.2	11.8	101.08	101.54				8.10	8.90	.80
8		27.25	28.30	32.4	32.9	35.95	9.6	10.55	101.10	101.36				6.495	6.99	1.98
Av. Lot F																
Difference E-F		8.65	+17.05	+16.7	+9.575	-7.65	0.85	+6.95	-0.06	+0.15				+1.505	+.845	
Spray E	6-22 to 6-26	18.4	2.8	5.8	7.6	16.2	9.2	2.4	100.94	101.12	22	90	44	8.66	9.38	.72
Cow No. 1		25.8	2.2	5	9.4	13.8	12.8	4	101.42	101.58	23	94	29	6.64	8.04	1.40
2		16.2	3.8	3.8	6.4	8.8	9.0	1.4	102.52	102.76	24	95	31	3.14	4.16	1.02
3		17.4	3.6	6.2	9.8	12.6	7.2	1.6	101.14	101.38	25	86	81	9.52	10.76	1.24
4		19.45	3.10	5.2	8.3	12.85	9.55	2.35	101.50	101.66	26	90	56	6.99	8.085	4.38
Av. Lot E																
Check F	6-22 to 6-26	20.8	21	19.8	22.8	25	7	5.2	101.28	101.66				3.72	4.98	1.26
5		21.6	19.4	19.2	24.2	23.8	7.8	7.6	102.42	102.38				5.60	7.30	1.70
6		15.6	11.4	11.4	14.4	16.4	10.8	10.2	101.2	101.4				5.40	6.92	1.52
7		14.2	12.6	13.8	12.2	17.4	7.8	8.2	101.22	101.88				7.66	8.70	1.04
8		18.05	16.10	16.05	18.4	20.60	8.35	7.80	101.53	101.83				5.595	6.975	5.52
Av. Lot F																
Difference E-F		1.40	+13.00	+10.85	+10.1	+7.70	+1.20	+5.45	+0.03	+0.17				+1.395	+1.110	

+ indicates advantage to spray lot.
- indicates advantage to check lot.

not raised appreciably. It was noticed that the spray lot did not switch their tails as much as the check lot by actual count and the spray lot seemed more contented. During both test weeks the advantage from the standpoint of milk production was in favor of the spray lot. In no case did the milk absorb the odor of the spray, the milk being tasted each day to determine this point. The cost of this spray for this period was approximately the same as that in table II.

The data recorded in table IV show that when a mixture of strained crank case oil and oil of tar (a fly repellent) was sprayed on the animals, it was found by actual count to repel flies efficiently for two hours of a two and one-half hour spray period under these conditions. The body temperatures of the animals were not raised appreciably by the application of this repellent. During both test weeks, the advantage from the standpoint of milk production over their previous weeks' milk production was in favor of the spray lot. In no case did the milk absorb the odor of the repellent. After one week of testing, a black oily residue was formed on the hair of the cows. This residue was removed on the first day of the rest period with soap and water. The cost of spraying four cows for one test week under these conditions was $0.060 or $0.0120 daily (approximately one-fourth cent a day per cow for one spraying).

Table IV. Comparative Tests of Spraying Strained Crank Case Oil and Oil of Tar (A Fly Repellent) Once Daily Against Flies on Dairy Cattle in the College Dairy Barn.

Cow Lot	1933	Before spraying	Number of flies on left side of body: After spraying: ½ hr.	1 hr.	1½ hrs.	2 hrs.	Number of tail switches in 1 minute periods: Spraying: Before	½ hr. after	Body temperature, degrees F.: Spraying: Before	After	Atmospheric conditions 3:00-4:00 p.m.: Date	° F.	Per cent relative humidity	Afternoon milk production: Previous week pounds daily	Pounds daily	Actual average: Gain	Loss	
Averages for one test week (five days). Time, 3:00-4:00 P.M. June																		
Spray G	6-28 to																	
Cow No. 1	7- 2	17.1	2	3	5	7.8	7.8	2	101.64	101.58	28	94	52	7.64	6.96		.68	
2		10.4	2	2.2	6.4	7.8	9.6	1.6	101.46	101.36	29	98	32	4.22	5.60			1.38
3		18	2.4	3.6	8.4	9.4	5.6	0.6	104.12	104.16	30	98	41	6.06	5.62		.44	
4		23.2	3.2	1.8	6.2	9.2	4	0.8	101.70	101.70	July 1	101	44.5	5.04	4.06		.98	
Av. Lot G		17.1	2.4	2.65	6.5	8.5	6.75	1.25	102.23	102.20	2	99	51.5	5.94	5.56		+.72	
Check H	6-28 to																	
5	7- 2	15.8	12.8	8.6	14.6	16.2	4	4.4	101.98	101.90				9.38	9.50			.12
6		15.6	11.8	10	15.6	17.8	5.8	3.6	101.74	101.92				4.32	5.9			1.58
7		25.8	14.8	16.2	19.2	19.6	8.2	6.4	101.78	101.68				4.5	6.6			2.10
8		17.4	8.8	9.8	14.4	17.6	6.2	4.2	101.98	102.20				9.82	8.94		.88	
Av. Lot H		18.65	12.05	11.15	15.76	17.80	6.05	4.60	101.87	101.925				7.005	7.735			2.92
Difference G-H		1.55	+9.65	+8.50	+9.26	+8.25	-0.30	+3.35	-0.36	-.275				-1.265	-1.175			
Spray G	7- 8 to																	
Cow No. 1	7-12	19	2.6	4.8	7	11	6.2	1	102.04	102.10	July 8	85	80.5	7.70	8.80			1.10
2		17.60	2.8	4	6.8	9.6	5.6	3	101.02	102.58	9	90	71	5.32	5.86			.54
3		18.20	2	4.4	6.4	13.4	5	0.8	103.56	103.76	10	90	68	6.82	6.52		.30	
4		19.40	2.2	4	5.6	10	5	0.2	101.78	102.06	11	93	59	3.48	3.54			.06
Av. Lot G		18.55	2.4	4.3	6.45	11	4.36	1.25	102.10	102.625				5.85	6.18			1.40
Check H	7-8 to																	
5	7-12	17.60	13.4	14.4	20.2	23.2	4.2	4.8	101.48	101.86				10.12	10.40			0.28
6		25.60	16.8	15.6	16.4	21	5.6	4.6	102.00	102.20				3.08	4.64			1.56
7		22.2	14.2	15.4	19.2	19.8	6.2	5.6	101.62	101.88				7.46	7.14	0.32		
8		25.00	11.8	12.6	16.0	19.4	5.2	5.2	102.06	102.02				10.02	10.44			0.42
Av. Lot H		22.60	14.05	14.50	17.95	20.85	4.25	5.05	101.79	102.015				7.67	8.15			1.94
Difference G-H		4.05	+11.65	+10.20	+11.50	+9.85	1.12	+3.80	-0.31	-0.610				-1.84	-1.975			

+ indicates advantage to spray lot.
- indicates advantage to check lot.

Other Observations Regarding Fly Sprays. The dairy barn was sprayed four afternoons with "Superla Insect Spray" and "New Bovinol", to test their killing power. Areas one yard square were marked off in six places in the dairy barn. Fly counts were made on these areas each thirty minutes from 5:15 - 7:45 p.m. each day the barn was sprayed. The flies were swept up and destroyed after each spraying test was completed.

The data recorded in table V indicate that Superla insect spray killed 93 per cent of the flies which came into contact with the spray. When New Bovinol was used only 64.8 per cent were killed and the others were revived. It was noticed that Superla killed quickly, while Bovinol killed slowly.

Table V. Fly Counts in Dairy Barn Spraying, 1932

Kind of spray	Date 5:15 - 7:45 p.m.	Av.no.flies: ½ hr. after: spraying in: 6 areas	Av.no.flies: 1 hr. after: spraying in: 6 areas	Percentage flies killed
Superla	6-23-32	54.33	52.33	
Superla	7-13-32	114.33	110.33	
Superla	9-19-32	50.83	41.17	
Total	3 days	219.49	203.83	93
New Bovinol	9-16-32	125.0	81.0	64.8

It has been the opinion of some dairymen that black haired animals have more flies on them than white haired ones. It was decided, therefore, to make some observations on this question.

There were no cows in the college herd which were completely black nor completely white; therefore two Holstein cows with the largest area of black spots, and two Holsteins with the largest area of white spots were selected. Two Holsteins (1 black and 1 white) were placed in the west end of the barn, and two Holsteins (1 black and 1 white) were placed near the center of the barn for observation.

The flies were counted on the black and white spots on both sides of the body of each cow, the fly counts being made every 15 minutes for a period of one hour and 45 minutes daily, making a total of 21 counts on each cow for three consecutive days.

The data recorded in table VI show that there were more flies on the cows with the largest black area during every fly count for the entire three days.

Table VI. Fly Counts on Dairy Cows
3:15-5:00 p.m. daily

Cow No.	Color predominating	Breed	Av.no.of flies on both sides of body Date 6-19-33	6-20-33	6-21-33
I	White	Holstein	37	27.12	28.25
II	White	Holstein	26.25	27.50	20.87
III	Black	Holstein	61.50	42.87	50.00
IV	Black	Holstein	48.75	45.12	33.62

OTHER TESTS AND OBSERVATIONS

The Insect Electrocutor

This insect electrocuting trap was of the wire cage type so constructed that when the fly touches the wire which serves as electrodes, it is electrocuted or injured in such a way that it will probably die. This is due to the fly causing a short circuit to occur between the wires and a spark jumping from one wire to the other through the fly

making a popping noise. The shock kills the fly quickly.

This trap used a 110 volt alternating current. The current goes directly into the transformer of the trap where it is stepped up to 4000 volts. This is an eight watt trap and the amperes on each wire electrode of opposite polarity are .002 amperes continuously while the trap is in operation.

Methods of Testing. The current used for this trap was measured by a meter in kilowatt hours. The trap was tested from June 16 - July 2 inclusive. During the week June 16-22 inclusive, the following baits were tested: (1) silage, (2) beet pulp with molasses, milk, and water, (3) spoiled bananas, (4) horse meat, (5) sour milk, (6) soured beet pulp and sour milk.

Table VII. Bait Tests with the Insect Electrocutor, 1932
June 16-22 inclusive

Bait No.	Length of period daily 2:15-4:45 p.m.	No. of flies trapped	Species	Current used in Kw. hrs.	Air temperature degrees F.
I	2½ hrs.	558	M.domestica L.	0.05	86
		14	H.irritans L.		
		2	S.calcitrans L.		
II	2½ hrs.	1133	M.domestica L.	0.10	94
		2	Lucilia sp.		
III	2½ hrs.	2178	M.domestica L.	0.07	88.5
		1	H.irritans L.		
		1	S.calcitrans L.		
IV	2½ hrs.	1785	M.domestica L.	0.08	78
		5	H.irritans L.		
		8	Lucilia sp.		
V	2½ hrs.	1136	M.domestica L.	0.07	82
		3	H.irritans L.		
		4	Lucilia sp.		
VI	2½ hrs.	1238	M.domestica L.	0.05	85
		1	Lucilia sp.		
Total	15 hrs.	8599		0.42	
Average daily	2½ hrs.	1433		0.07	

For periods of two and one-half hours of this test, spoiled bananas proved to be the best bait for the number of flies trapped. The daily cost to operate this trap for two and one-half hour periods from 2:15 - 4:45 p.m. daily was $.0028 per kilowatt hour. The cost of .42 kilowatt

hours at a four cent rate equals $.168 for 15 hours.

Conclusions of the Fly Trap Experiment.

1. More flies were destroyed in 8 hour periods with sour milk bait in the insect electrocutor than were caught in the box cone trap.

2. The insect electrocutor was found to destroy a number of stable and horn flies, while about 99 per cent of the flies caught in the box cone trap were house flies.

3. For periods of two and one-half hours, spoiled bananas proved to be the best of six baits tested in these experiments.

4. On each of three consecutive days under the same conditions, a total of 34,422 flies were caught in the insect electrocutor during 8 hour periods, while only 18,385 were caught in the box cone trap.

Observations Regarding the Relation of the Air Temperature and Percentage of Relative Humidity on the Number of Flies on Dairy Cows

Methods of Testing. In order to determine the average number of flies on the left sides of eight animals before spraying, it was necessary to find out the number of flies on each cow daily and divide by eight. The average air temperatures between 3:00 and 4:00 p.m. were determined by two readings of an ordinary thermometer. To illustrate the relation of the air temperatures and relative humidity, the

observed relationship is best shown by graphs (Figures I-XII inclusive).

Results of average air temperature in relation to average number of flies on dairy cows, Figures I-IV inclusive, indicate that when the average temperature is above 85 degrees Fahrenheit, the average number of flies on the cows is small and as the air temperature decreases, the number of flies on the animals increases until about 70 degrees Fahrenheit is reached. Figures V-VIII inclusive indicate that when the average air temperature was exceedingly high (90-101 degrees F.), the average number of flies on the cows was exceedingly small and as the average air temperatures go below 85 degrees F., the number of flies will increase.

The percentage of relative humidity was determined by means of a Tycos hygrometer and a psychrometric table.

Figures IX-XII inclusive indicate that when the percentage of relative humidity was high, the average number of flies on the left sides of the dairy cows were small, and when the percentage of relative humidity was low, the average number of flies were more abundant on the dairy cows.

Discussion. The author noticed that on extremely warm days, a large number of flies would hover in the gutter and on the lower concrete wall of the dairy barn instead of

Fig. I

Curves of average air temperature °F. 3-4 p.m. daily and average number of flies daily on 8 cows before spraying, during the five day test week.

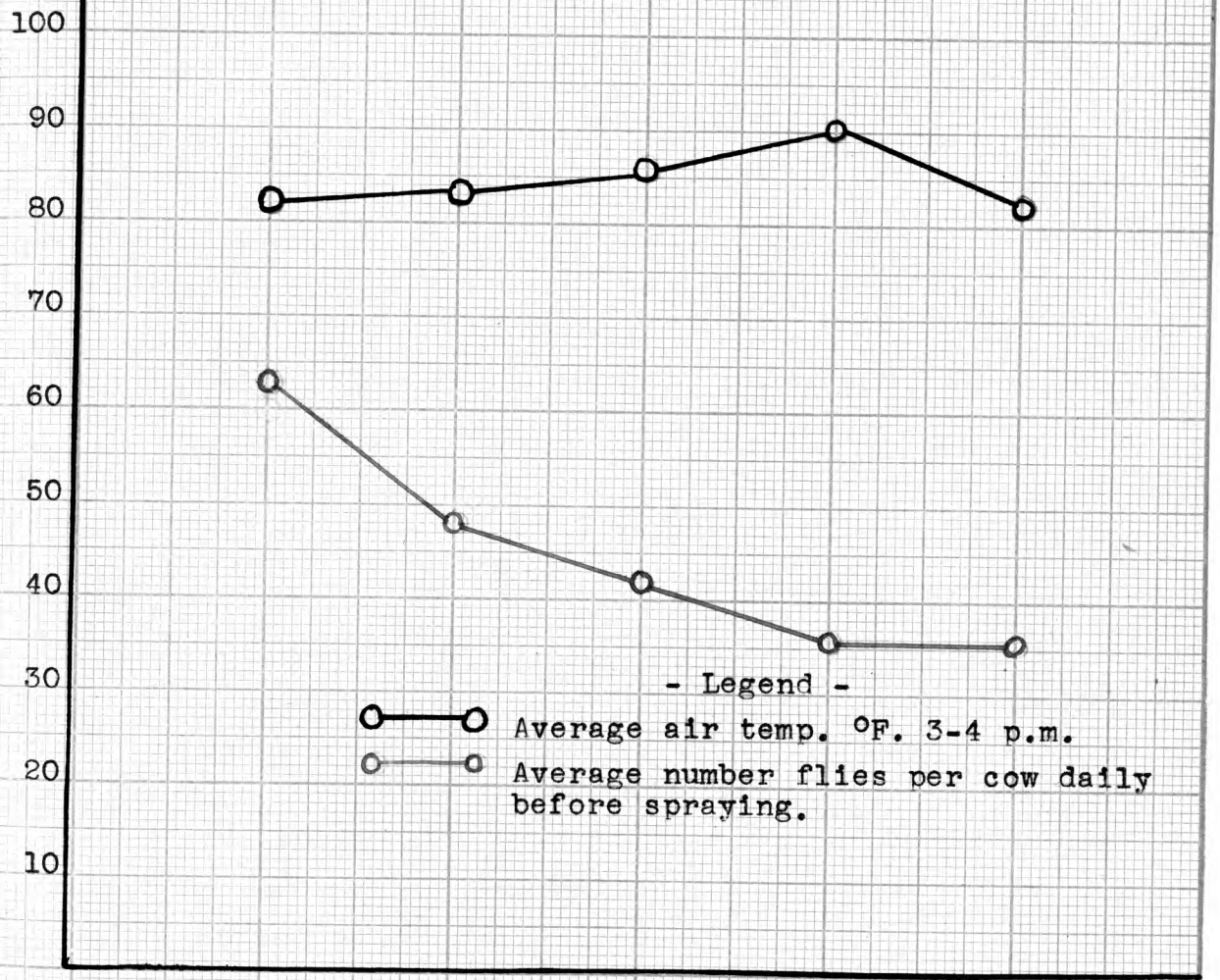

Fig. II

Curves of average air temperature °F. 3-4 p.m. daily and average number of flies daily on 8 cows before spraying, during the five day test week.

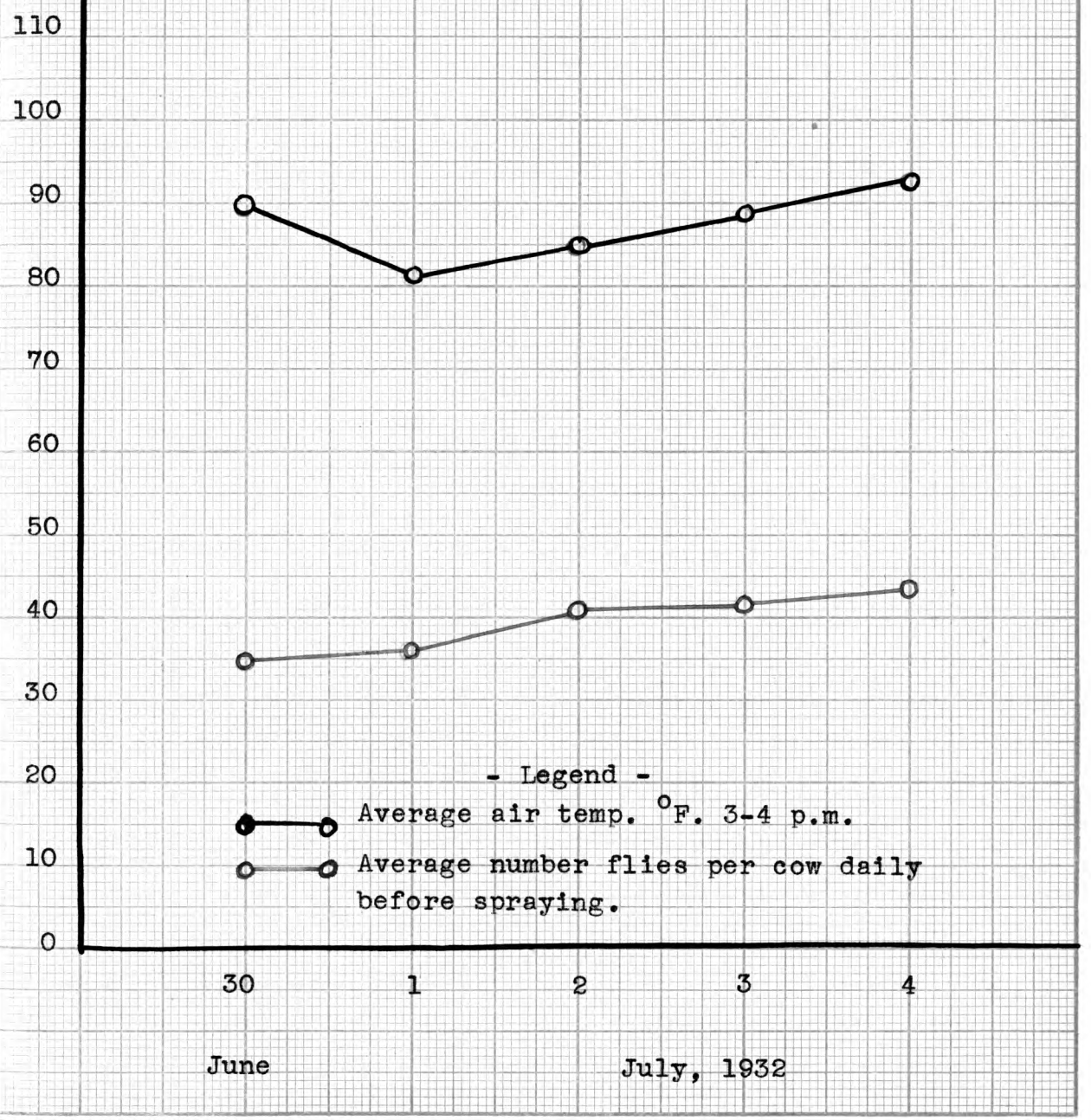

Fig. III

Curves of average air temperature °F. 3-4 p.m. daily and average number of flies daily on 8 cows before spraying, during the five day test week.

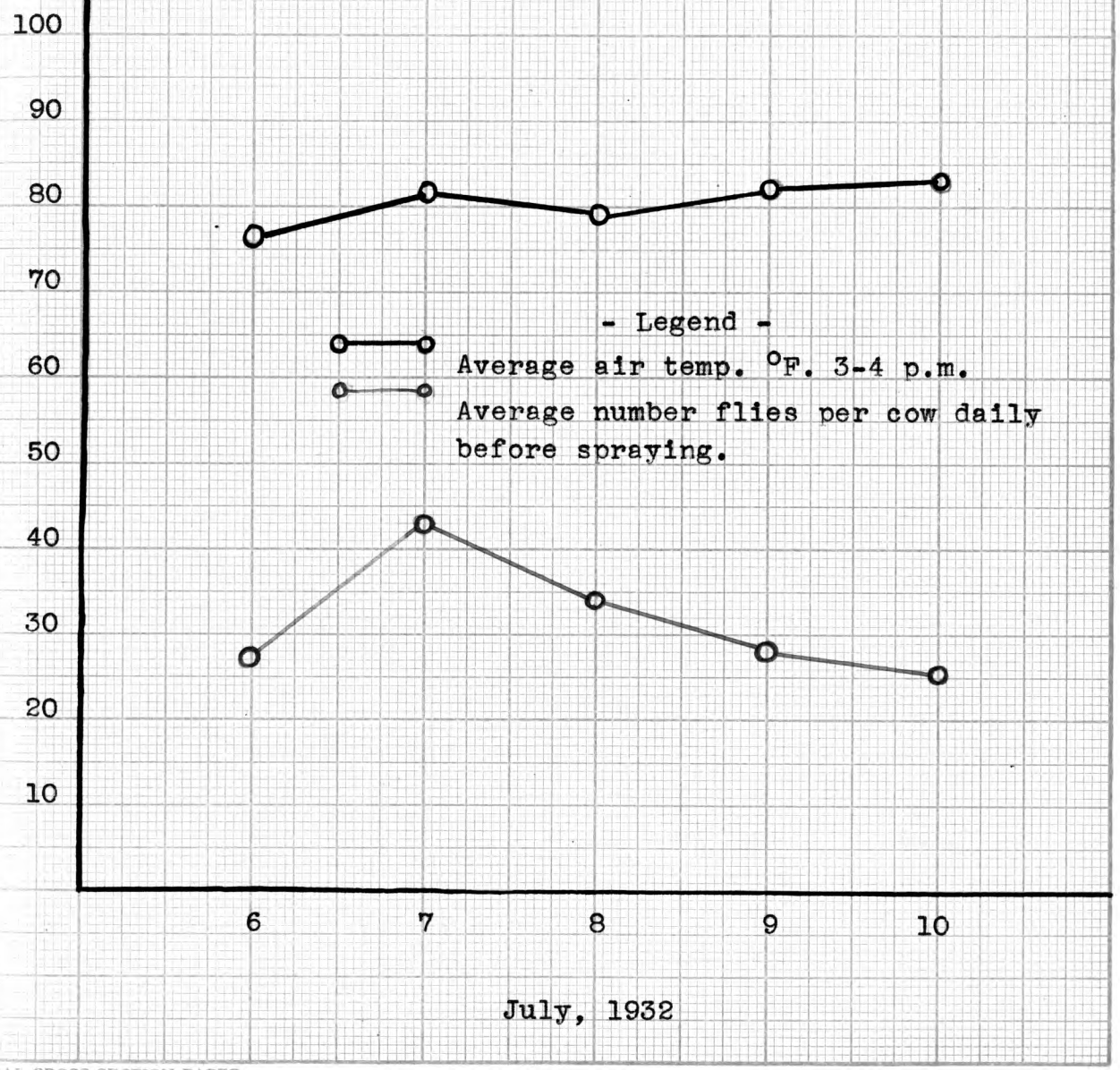

Fig. IV

Curves of average air temperature °F. 3-4 p.m. daily and average number of flies daily on 8 cows before spraying, during the five day test week.

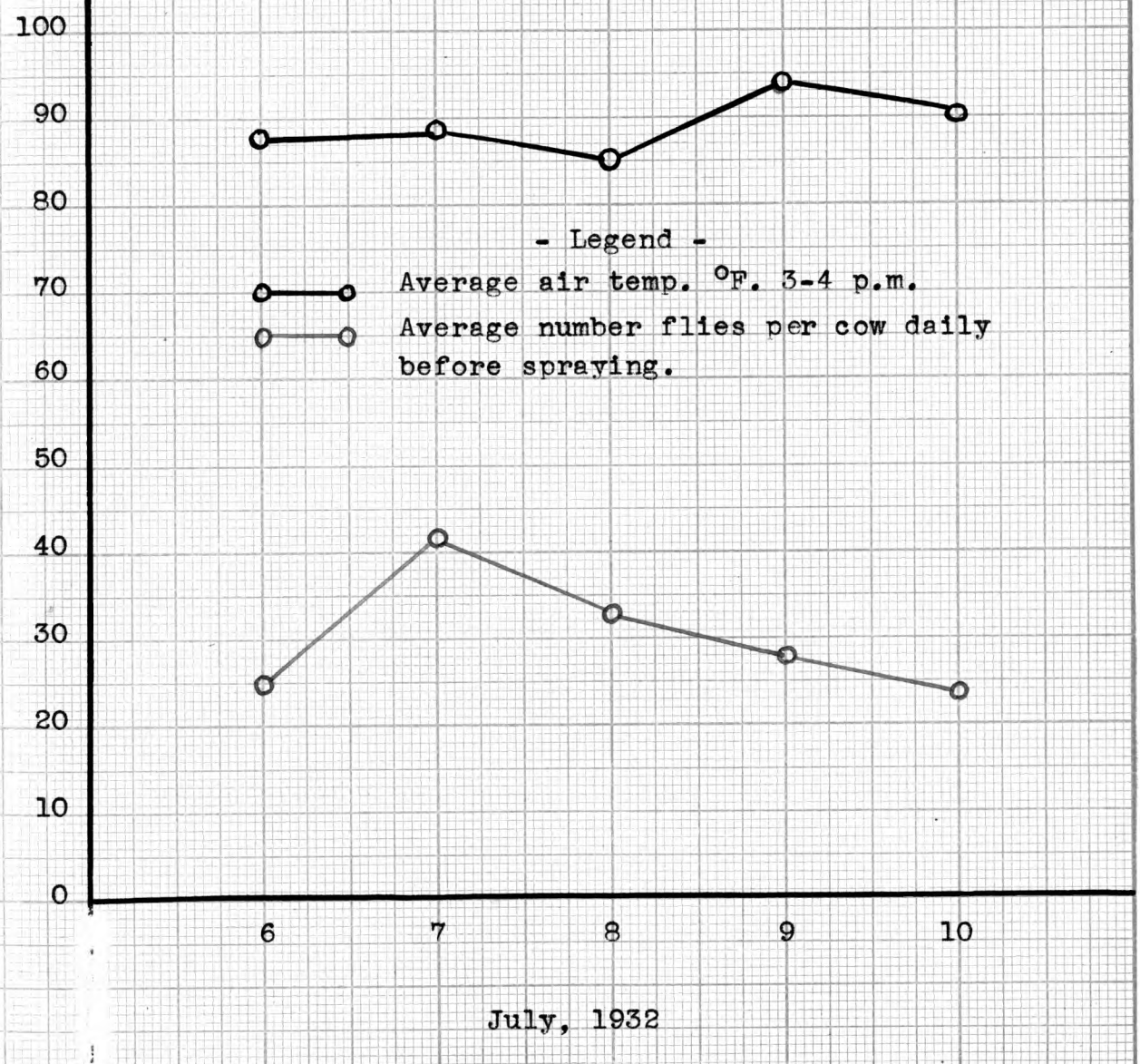

Fig. V

Curves of average air temperature °F. 3-4 p.m. daily and average number of flies daily on 8 cows before spraying, during the five day test week.

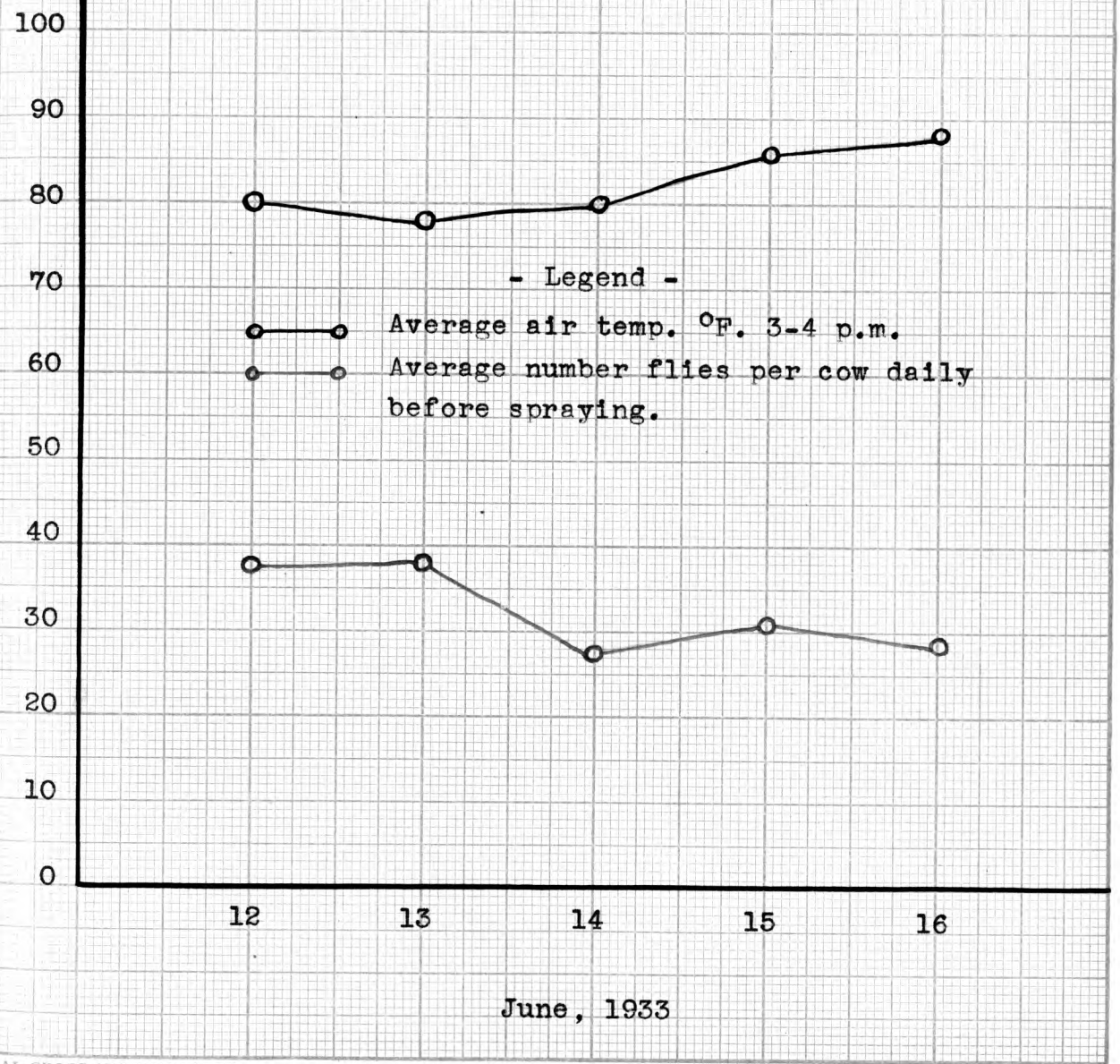

Fig. VI

Curves of average air temperature °F. 3-4 p.m. daily and average number of flies daily on 8 cows before spraying, during the five day test week.

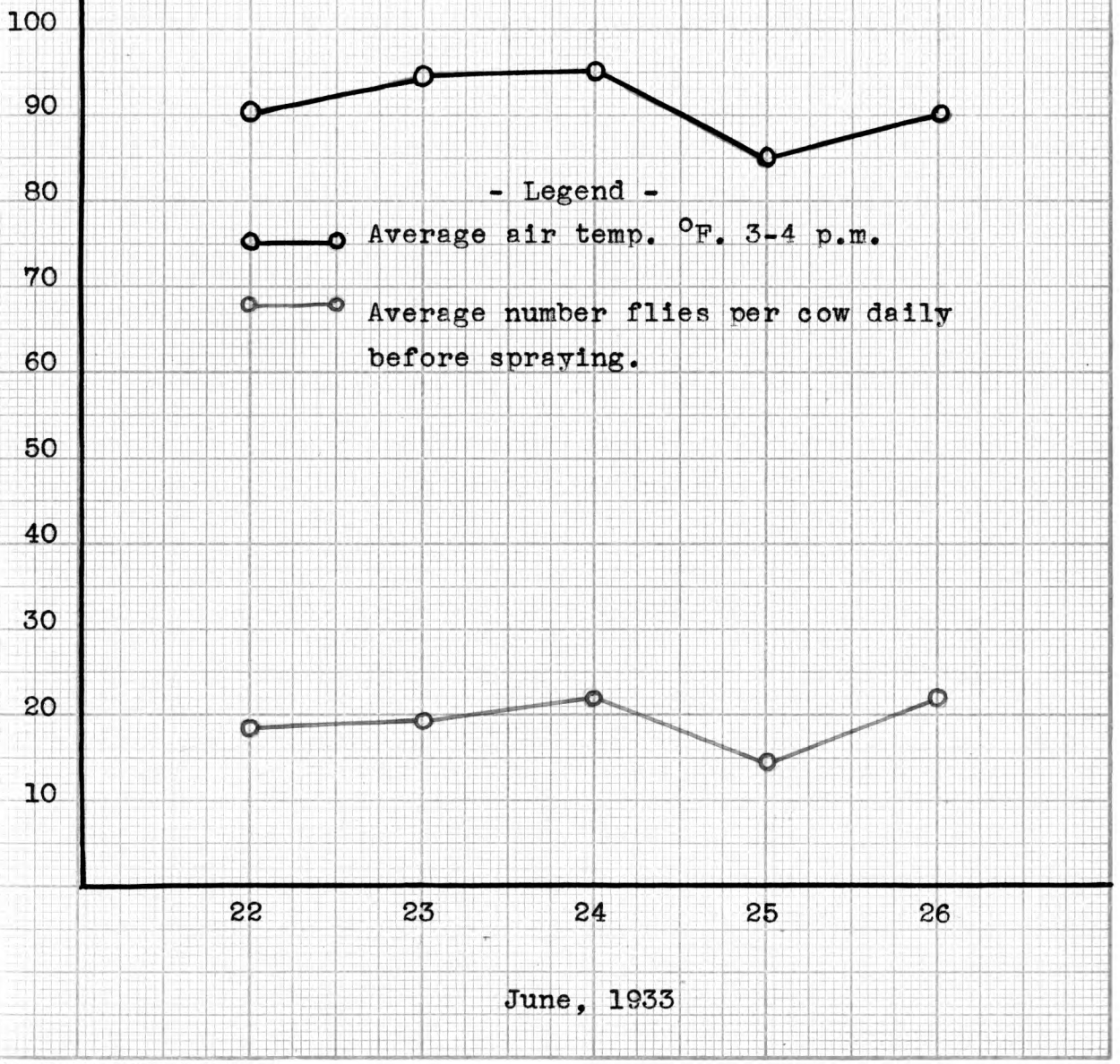

Fig. VII

Curves of average air temperature °F. 3-4 p.m. daily and average number of flies daily on 8 cows before spraying, during the five day test week.

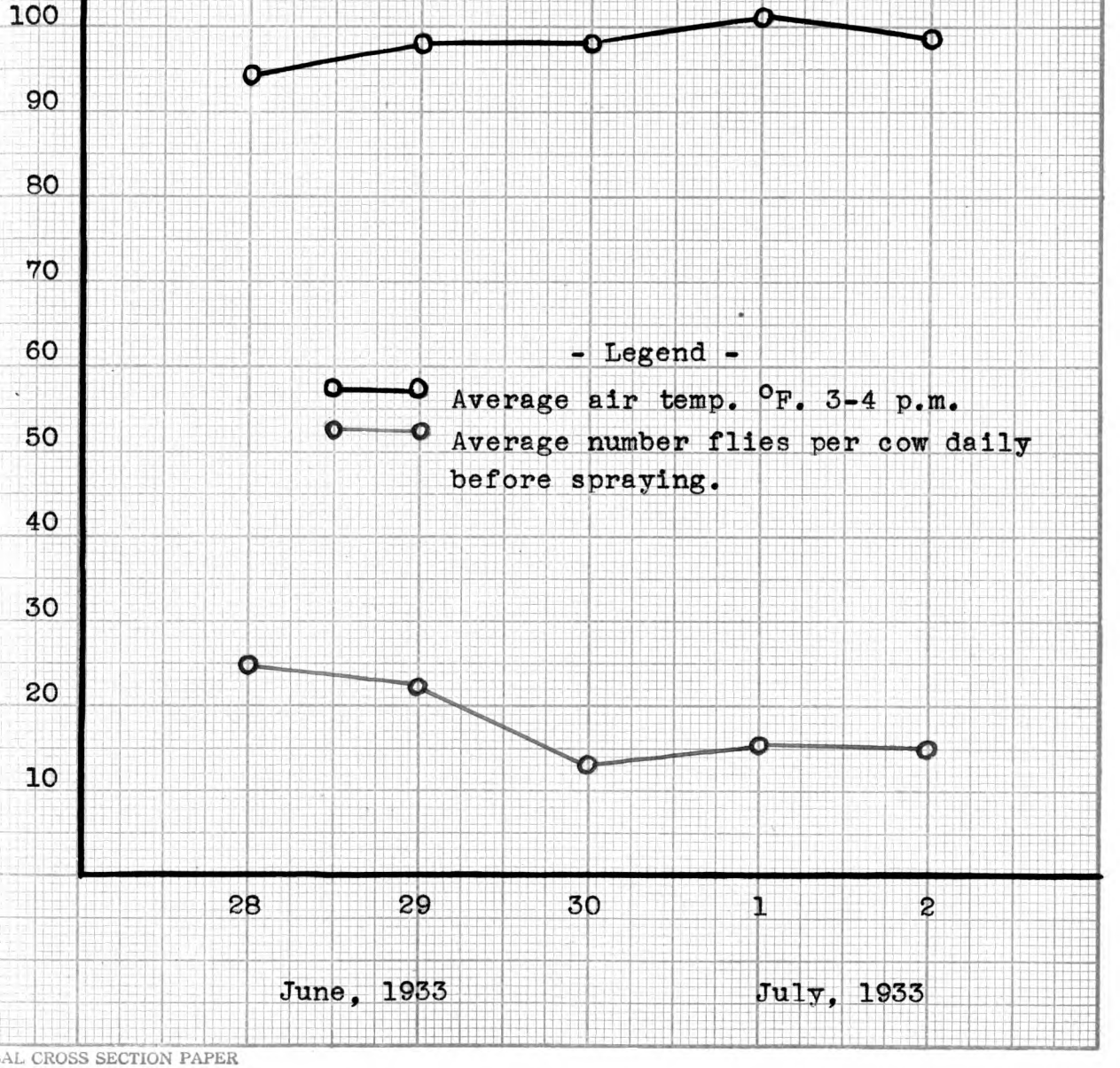

Fig. VIII

Curves of average air temperature °F. 3-4 p.m. daily and average number of flies daily on 8 cows before spraying, during the five day test week.

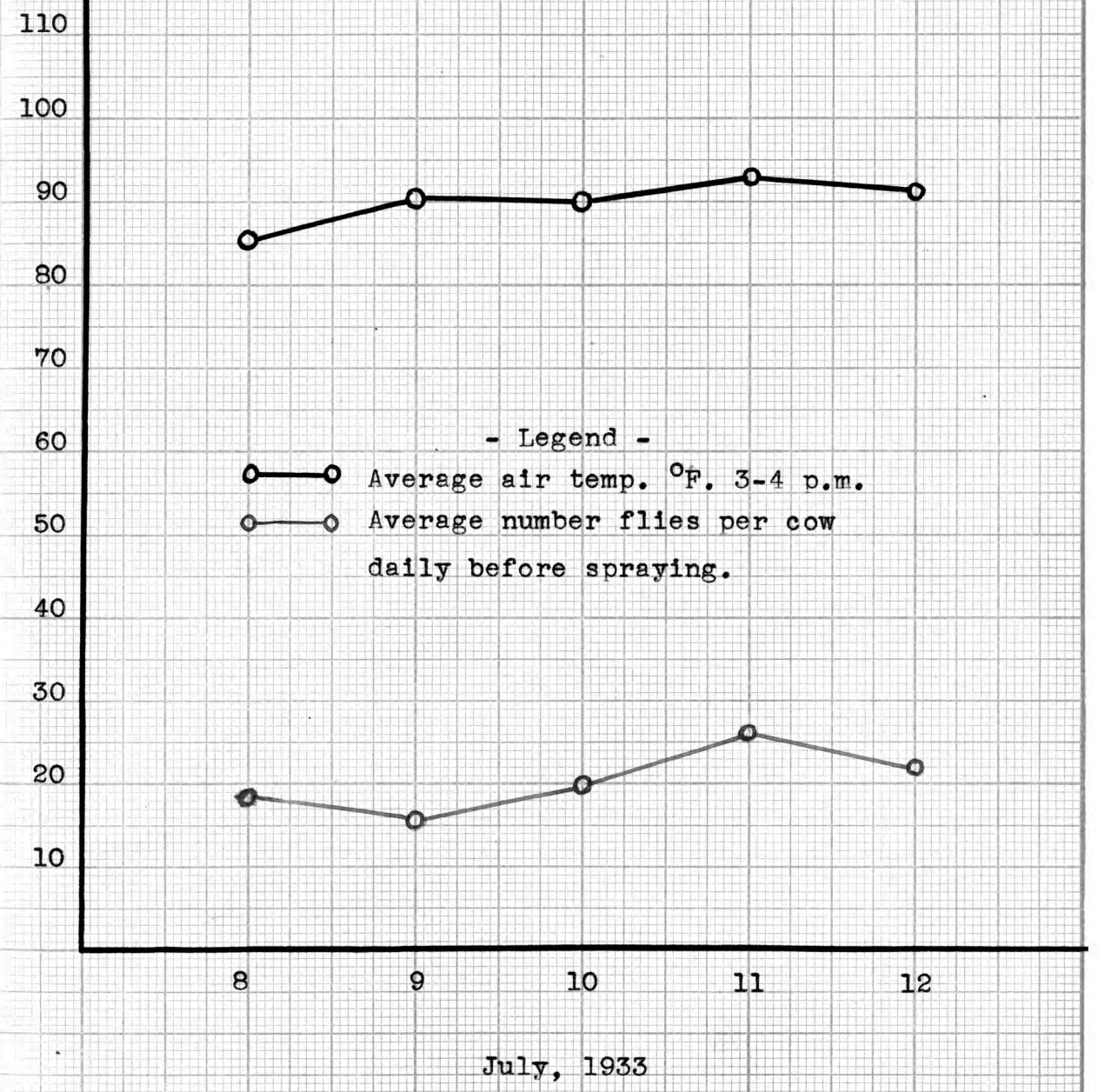

Fig. IX

Curves of the % of relative humidity 3-4 p.m. daily and average number of flies daily per cow before spraying, during five day test week.

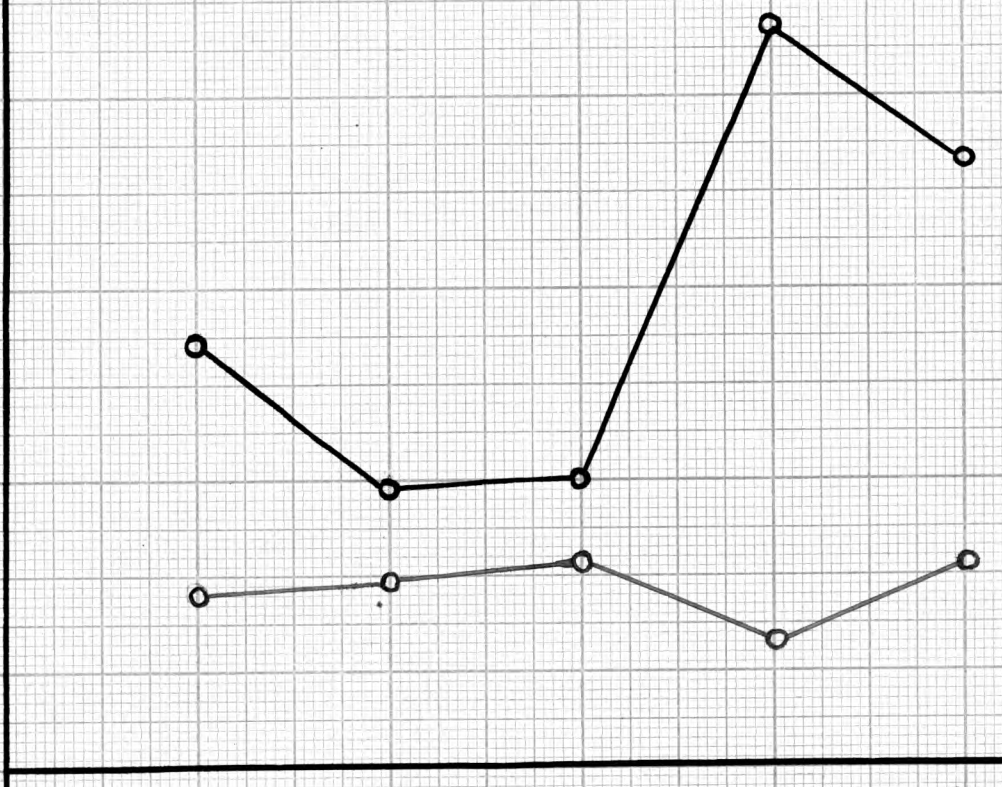

Fig. X

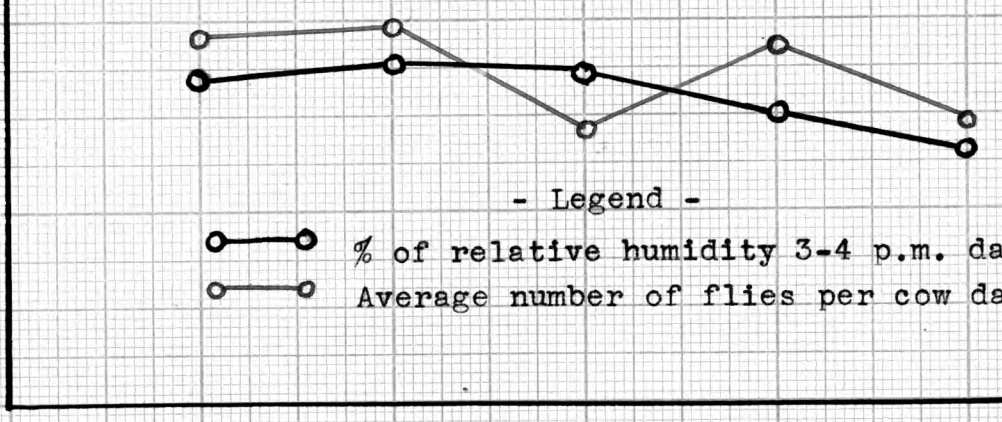

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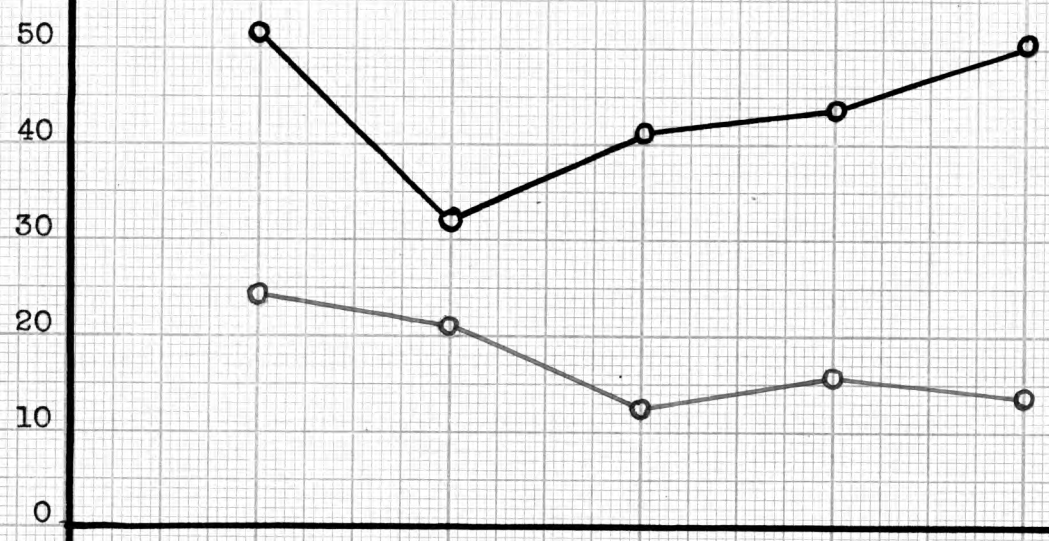
Fig. XI

Curves of the % of relative humidity 3-4 p.m. daily and average number of flies daily per cow before spraying, during five day test week.



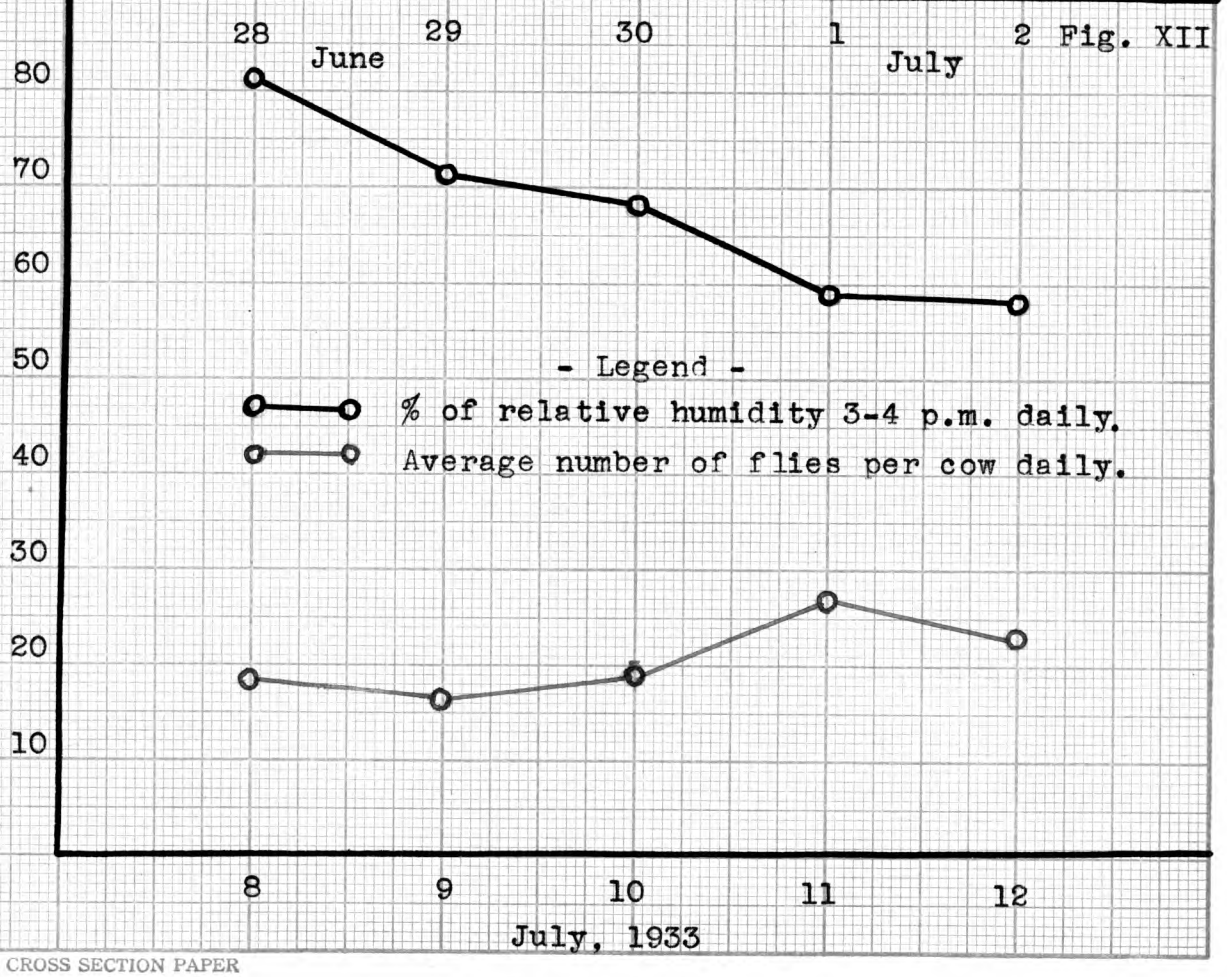


Fig. XII

tormenting the animals.

GENERAL CONCLUSIONS WHICH APPEAR TO BE INDICATED FROM THESE COMPARATIVE TESTS

1. That Superla insect spray oil kills flies very efficiently, has repellent value for from 10 to 20 minutes, does not raise the body temperatures of the dairy animals appreciably, aids slightly from the standpoint of milk production, and makes an excellent spray for destroying flies in a barn provided the barn is closed and the cows removed.

2. That Palustrex-soap solution is a good fly repellent for periods of one and one-half hours against flies, and that in 1933 the cows which were sprayed with a 30 per cent solution gave a slight gain in production of milk.

3. That strained crank case oil and oil of tar proved to be the best repellent tested against the attacks of flies found on animals, but left an oily residue upon the hair of the animals.

4. That in none of these tests was the body temperature raised appreciably.

5. That spraying dairy cows adds to the convenience of milking and helps to keep the cows contented.

6. That in no case did the milk take the odor of any spray used.

7. That the insect electrocutor used only a small amount of electric current, was easy to operate, but the

initial cost was high for the dairyman who is making a living from the operation of his dairy.

8. That a mixture of strained crank case oil and oil of tar aids in the convenience of milking, aids slightly in increasing or maintaining milk production, and repels flies from the animals.

9. That when the average air temperature was above 85 degrees F. in the dairy barn, the average number of flies tormenting the cows was small and when the average air temperatures were between 70-85 degrees F., the number of flies was large under these conditions.

10. That when the percentage of relative humidity in the dairy barn was high, the average number of flies on the cows was small, and when the percentage of relative humidity is low the average number of flies on the cows was more abundant under these conditions.

11. The author would recommend a mixture of strained crank case oil and oil of tar (a fly repellent) and Palustrex-soap solution (concentration of 350 cc. per quart of soap solution) as repellents against flies on dairy cattle from the standpoint of the results obtained in these comparative tests.

ACKNOWLEDGMENTS

I acknowledge indebtedness to Dr. Roger C. Smith for his valuable counsel and guidance in this work; to Prof. Harry W. Cave and Mr. C. O. Bigford for the use of the College dairy herd in making fly spray tests; to Mr. R. W. Walters for the use of his herd in testing fly repellents; to Prof. Geo. A. Dean, Dr. E. J. Frick, Dr. W. L. Latshaw, and Mr. C. A. Logan for valuable suggestions and to the Standard Oil Company of Indiana, the E. W. Colledge Company of Jacksonville, Florida, and the California Chemical Spray Corporation for furnishing spray materials.

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