1949

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Effects of Weather, Sanitation and Chlorinated Chemical Residues on House and Stable Fly Populations on Nebraska Farms¹

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Since L. O. Howard's (1906) early report on house flies many entomologists have conducted research on these insects. Their reports range from notes on the hibernation of house flies, *Musca domestica* L., to lengthy papers on the biology and control of house flies and stable flies, *Stomoxys calcitrans* (L.). Early control studies stressed the importance of sanitation, screening and the use of mist type contact insecticides. These standard control measures have not, however, received much attention in the United States since Wiesmann (1943) reported on the prolonged effectiveness of a new insecticide "Gesarol." Scores of other workers have also published on the use of this material, now known as DDT, for the control of flies. Today our knowledge of this chemical in relation to flies is steadily increasing.

Early experiments with DDT in this country were necessarily confined to laboratory and small scale field tests. Among the early publications, however, were reports on the practical control of flies. Van Leeuwen (1944) reported practical destruction of house fly populations following single barn treatments while Blakeslee (1944) obtained little or no control of stable fly populations outside of treated barns and only a 12-day effective period on the inside.

The experiments reported in this paper were conducted during the summers of

1947 and 1948. They were designed to obtain information on the comparative efficiency of residual building sprays of DDT, methoxychlor methoxychlor, dichlorophenyl dichloro-ethane, chlorinated camphene and chlordan for house fly and stable fly control in milk barns; to study the effect of sanitary practices on house fly and stable fly populations in treated milk barns and to determine the comparative efficiency of chlorinated chemical residues as barn treatments and complete premises treatments. A preliminary report of the 1947 tests was made by Muma & Hixson (1948) but results were considered to be inconclusive.

PROCEDURE AND METHODS.—To assure adequate fly populations throughout the test period only dairy farms were selected for the experiments. It was felt that the animal populations on hog, sheep or cattle feeding farms and grain farms might vary sufficiently during the season to cause undesirable fluctuations in the total fly population. Dairies were selected at random irrespective of the number of milking animals. All dairies were located within a 20-mile radius of Lincoln, Nebraska.

Ten farms were used in the 1947 experiments. Only milking barns and loafing sheds were treated on each farm. Two farms were treated with each of the fol-

¹ Published with the approval of the Director as Paper No. 408 Journal Series, Nebraska Agricultural Experiment Station.

lowing insecticidal formulations: 2.0 per cent water suspension of DDT from 50 per cent wettable powder,¹ 2.0 per cent water suspension of methoxychlor from a 50 per cent wettable powder,² 2.0 per cent water suspension of dichlorodiphenyl dichloroethane from a 50 per cent wettable powder,³ 2.0 per cent water suspension of chlordan from a 50 per cent wettable powder⁴ and 2.0 per cent water emulsion of chlorinated camphene from a 25 per cent emulsion concentrate.⁵ All treatments were applied as sprays from a greenhouse type power sprayer at about 60 pounds pressure through a three nozzle spray broom equipped with number 4 disk openings.

Walls and ceilings were sprayed until the surfaces were wet just short of run-off. No attempt was made to determine the deposit of the insecticides on the various surfaces treated. Wall and ceiling surfaces varied within barns and between barns including unpainted wood and concrete, painted wood and concrete and various types of wall board.

In the 1948 experiments, 38 dairy farms were treated. Six different insecticidal formulations were used both as barn and complete premises treatments. An additional formulation was used solely as a barn treatment. DDT as a 2.0 per cent water suspension from a 50 per cent wettable powder³ was used for three barn and four premises treatments. Dichlorodiphenyl dichloroethane as a 2.0 per cent water suspension from a 50 per cent wettable powder³ was used for 3 barn and 3 premises treatments. Methoxychlor as a 2.0 per cent water suspension from a 50 per cent wettable powder² was used for 3 barn and 3 premises treatments. Chlordan as a 2.0 per cent water suspension from a 50 per cent wettable powder⁴ was used for 3 barn and 3 premises treatments. Chlorinated camphene as a 2.0 per cent water emulsion from a 50 per cent emulsion concentrate⁵ was used for one barn treatment. A mixture of 10.0 per cent piperonyl butoxide and 0.50 per cent pyrethrins at a rate of 8 pounds of a 25 per cent wettable powder per 100 gallons of water⁷ was used for 3 barn and 3 premises treatments for the initial spraying and at 2-week intervals as barn treatments on the same six farms for the duration of the experiment. The piperonyl butoxide-pyrethrin mixture was used

repeatedly at this sub-residual concentration to test the effect of a quick knock-down contact insecticide on fly populations. All original treatments were applied as sprays from an orchard type power sprayer at about 200 pounds pressure through a single nozzle, trigger type spray gun with a number 6¹ disk opening. Later treatments of piperonyl butoxide-pyrethrin were applied with the equipment used in 1947. Surfaces were sprayed until run-off occurred. Treatments designated as barn treatments consisted of an inside spraying of the entire barn that housed the milking room. Premises treatments consisted of a complete spraying of all barns, sheds, wind breaks, feeding racks, trees, shrubs and fences in the farm lay out.

Fly populations were sampled at weekly intervals in the milking rooms and adjacent loafing sheds only. Sampling consisted of trapping flies on fly paper ribbons⁸ exposed for 24 hours on hanging strips of lath or lattice. Each lath exposed one-third of a square foot of trapping surface. One square foot of trapping surface was exposed for every 1000 square feet of ceiling in the milking room and directly connecting loafing sheds or rooms. The proportion of trapping surface to ceiling area was calculated to the nearest one-third square foot and ribbons were hung at regular intervals within the sample areas. House flies, stable flies and other flies were recorded on each one-third square foot sample unit following each 24 hour exposure period. Trapping surfaces were removed following each exposure period and were renewed each week. The objections to such a sampling method were fully recognized but it was felt that recordings would be considerably more accurate than those obtained by the commonly used population estimations, unit area (square foot or yard) counts, short exposure period traps or attractants as used by Brett & Fenton (1946) or electric fly traps. Location of the sample units restricted analyses of results obtained to conditions within the milking barns.

¹ Pennsylvania Salt Co., Philadelphia, Pa.

² Du Ponts, Wilmington, Del.

³ Rohm & Haas, Philadelphia, Pa.

⁴ Dow Chemical Co., Midland, Mich.

⁵ Hercules Powder Co.

⁶ Velsicol Corporation, Chicago, Ill.

⁷ U. S. Industrial Chemicals, Inc., New York.

⁸ Russell Sales & Mfg. Co., New York.

Sanitary conditions were recorded near the end of the test period for each season. A sanitation index was established to assure as nearly as possible a uniform evaluation of the several test farms. This index was based on use by the farmer of the following sanitary fly control measures: (1) frequency in cleaning the floor and gutter of the milking room and loafing shed, (2) frequency in removing and spreading manure piles, (3) the use of isolated frequently cleaned sheds and buildings as regular quarters for farm animals and (4) the destruction or removal of old hay and straw stacks, piles of bedding and silage and other obvious stable fly breeding sites. Farms using all four of these sanitary measures were given an excellent sanitation rating, those using 3 were rated good, those using two were rated fair and those using only one were rated poor. No farm failed to use at least one of these practices. Breeding sites for which the farmer was not directly responsible or over which he had no control were also included in the indexing. Among these were intermittently flowing or stagnant streams, temporary marshes or swamps and flash-flood debris.

WEATHER.—Temperature, rainfall and wind all greatly influence fly populations. This has been demonstrated by Bishopp

(1913) for the stable fly and Bishopp *et al.* (1915) for the house fly. These factors have not, however, been given adequate consideration in analyses of chlorinated chemical control data. Only general, vague statements concerning weather and fly control appear in available literature.

Results obtained in the present study show that weather as expressed by temperature and rainfall may cause considerable variation in practical fly control data. Mean temperatures and rainfalls and resultant population changes for 1947 and 1948 are shown in figures 1 and 2 respectively. Certain fluctuations in fly populations may be correlated with these weather factors. House fly numbers varied directly with increases and decreases in mean temperatures after chemical treatments had lost their efficiency. As the tests were discontinued 5 to 6 weeks after the loss of chemical effectiveness little opportunity was afforded to study the combined effect of temperature and rainfall on house flies. Chemicals did not, however, appear to give prolonged control of stable flies and there was a distinct correlation between weather and population variations. The only fluctuations in stable fly populations that did not follow changes in temperature and rainfall were the depres-

FIG. 1.—Fluctuations of house and stable fly populations following shifts in mean weekly temperatures and total weekly rainfalls at Lincoln, Nebraska, Summer, 1947.

FIG. 2.—Fluctuations of house and stable fly populations following shifts in mean weekly temperatures and total weekly rainfalls in Lancaster County, Nebraska, Summer, 1948. Temperature and rainfall figures represent means of recordings at 5 official weather stations within the county.

sions obtained on August 25, 1947, and August 3, 1948. As these depressions succeeded similar population peaks of three weeks duration they may have been due to a biological cycle.

The influence of wind upon fly populations was not as striking as that of temperature and rain. No general population changes over an extended period of time appeared to be caused by this factor. There were, however, decided temporary effects on the isolated populations at each farmstead. The most easily observed was that on adult activity. On cool windy days few flies of either species were active and in some instances were found only on protected sun warmed walls. Warm windy days, on the other hand, seemed to drive the flies into the barns and sheds in large numbers. On either warm or cool windless days few flies were found within the barns. Temperatures and wind velocities causing these population habits were not recorded.

These data demonstrate the need for careful study of the weather during practical fly control experiments. Otherwise false control periods may be obtained when weather conditions are unfavorable to fly development and activity and apparent failure of chemical control may be obtained in favorable fly weather.

Sanitation.—The importance of sanitation in the control of house flies was suggested by Howard (1906). He stated that flies breeding in filth and feeding on foods constituted a health hazard, and that a clean up of breeding sites was a necessary adjunct to any control program. Entomologists have, as a result of this report, advocated sanitation as a primary house fly control measure. Since the development of DDT, however, reports on the necessity of sanitation in house fly control have been contradictory.

Many entomologists have continued to recommend sanitary practices, conceding the fact that sanitation is necessary. Simmons & Wright (1944) tested DDT for preventing house fly emergence from manure piles. They almost eliminated emerging flies for a period of 18 to 67 days but cautioned against indiscriminate use of the chemical until more was known about its toxicology. Bruce & Blakeslee (1946) were unable to duplicate these results reporting that "treatment of infested manure piles with DDT sprays as a supplement to barn spraying was only

partly effective and is not considered of much practical value." They did, however, state that "the interior finish of the dairy building and the fly sanitation maintained on the premises were in most cases the limiting factors in the degree of control obtained."

Some entomologists have reported house fly control with DDT in the face of nearby breeding sites indicating that sanitation is not necessary. Wiesmann (1943) obtained 28 day complete control and 36-day practical freedom from flies despite an adjacent fly-breeding manure pile. Similar results were reported by Sweetman (1946) who controlled flies with spot treatments of 25 per cent DDT even though a nearby manure pile was not treated or removed. Sweetman, however, made repeated spray applications, stating that heavy fly populations rendered the spray residue ineffective in as short a time as 3 to 5 days. In additional tests Sweetman was unable to prevent fly breeding in manure around a piggery and reported that rotation of feeding equipment prevented accumulation of manure.

Similar apparent contradictions on the importance of sanitation also appear in stable fly studies. In the grain belt Bishopp (1913) reported a close relation between rain, hay or straw stacks and stable fly outbreaks. King & Lenert (1936) demonstrated stable fly breeding in shore deposits of sea weed in Florida. Simmons & Dove (1941) added peanut litter to the list of breeding sites and Simmons (1944) found infestations in waste celery. Sanitary control measures were highly recommended by Bishopp (1939) who listed a large number of conditions under which stable flies would breed.

Simmons & Wright (1944) conceded the importance of controlling stable flies at the breeding sites and for 32 days obtained almost complete elimination of emergence from peanut litter by spraying with DDT. With the same chemical Blakeslee (1945) obtained control of emerging flies from shore deposits of marine grasses. According to Blakeslee, DDT also permanently protected this media from critical fly breeding. Other workers, including Wiesmann (1943), Bruce & Blakeslee (1946) and Sweetman (1946) have inferred the unimportance of sanitation in reporting stable fly control without treating or removing adjacent breeding materials.

Sanitation has been considered important in all Nebraska fly control tests with chlorinated chemicals. Tate & Muma (1946) blamed apparent failure of DDT to control stable flies on incomplete treatment or the presence of nearby breeding sites. In 1947 an attempt was made to establish standards for measuring the possible effects of sanitation on fly populations in treated barns. Since then a sanitation index method of evaluation has been used to help analyze the fly populations. This index appears to result in more reliable data than the general observations so often used. Even more accurate records could probably be obtained with an index utilizing a longer series of standards. In addition to the standards previously discussed frequent cleaning of poultry houses, elimination of permanent hog wallows, cleanliness and rotation of hog lots, frequent chemical treatment of outdoor toilets and regular scraping of the barn yard might also be utilized.

From the 1948 data presented in figure 3 it is apparent that sanitary conditions on the farmstead limit the effectiveness of chlorinated chemical residues on house fly populations. As all of the farms used for these data were treated with a chlorinated chemical the population peaks shown are probably considerable lower than would have been obtained under untreated conditions. The 1 to 4-week increase in control of house flies obtained by sanitary practices seems to be large enough to merit consideration. The shorter control periods obtained under unsanitary conditions may have been due to

a masking of chemical effectiveness or to a covering or wearing away of the residues by the large fly populations. Sanitation data collected during 1947 gave the same trends as those figured for 1948 but were not considered to be conclusive due to the smaller number of barns, 10 in 1947 compared to 38 in 1948.

Stable fly populations apparently are not influenced by the sanitary practices used as standards in these experiments. Figure 4 gives the population trends for the several sanitation ratings in 1948. The lack of correlation between degree of sanitation and fly populations indicates the need for further studies on the breeding grounds, life history and migration habits of the stable fly in this area. Flies may be breeding in obscure or hidden places. It is also possible that farm sanitation may greatly reduce the number of flies but be offset by flies following animals from distant pastures or adjacent farmsteads.

CHLORINATED CHEMICAL RESIDUES.—There seems to be a considerable difference of opinion among the many workers as to what constitutes an effective chlorinated chemical control. This is evidenced by the fact that Sweetman (1946) stated that repeated DDT sprayings of selected spots at intervals of 3 to 10 days gave effective control of both stable flies and house flies while Bruce & Blakeslee (1946) "effectively checked" a stable fly outbreak for a period of control "conservatively estimated at 2 weeks" with a single premises treatment and "retained effective control (of house flies) for an average of 173 days" with single treatments in 4 ceiled and painted dairies. Other differences in what constitutes an effective control period were reported by Wiesmann (1943), Blakeslee (1944), Van Leeuwen

FIG. 3.—Effects of sanitation on efficiency of chlorinated chemical residues in controlling house fly populations in milking barns, Lancaster County, Nebraska. Summer, 1948.

FIG. 4.—Effects of sanitation on efficiency of chlorinated chemical residues in controlling stable fly populations in milking barns, Lancaster County, Nebraska. Summer, 1948.

Table 1.—Effect of residual barn treatments of fly populations in the milking rooms and directly connecting loafing rooms or sheds in 1947.

TREATMENT	MEAN NUMBER OF TRAPPED FLIES PER HANGING SQUARE FOOT IN 24 HOURS												FARM SANITATION		
	Treatment Date July 18														
	July				August			September							
Fly Species	11	18	22	29	6	12	19	2	9	16	22	Poor	Fair	Good	
Wettable DDD 2.0 per cent															
House flies	34.5	15.6	0.6	5.4	0.9	7.8	13.8	66.0	24.3	65.1	39.0	1		1	
Stable flies	65.4	30.9	5.4	27.6	33.0	16.5	11.4	0.0	3.0	0.0	0.0				
Wettable DMDT 2.0 per cent															
House flies	48.0	21.6	2.1	3.9	1.5	2.4	18.3	9.6	108.9	74.1	155.4		1	1	
Stable flies	136.8	30.3	7.4	36.6	17.4	14.4	14.4	3.6	15.9	0.3	1.8				
Emulsion Chlorinated Camphene 2.0 per cent															
House flies	75.9	57.6	0.9	6.9	0.9	3.9	20.4	11.4	55.8	28.8	94.8		2		
Stable flies	99.0	67.8	3.0	59.4	50.1	28.2	24.3	1.8	10.8	3.0	0.3				
Wettable DDT 2.0 per cent															
House flies	12.0	6.0	0.0	5.7	1.5	1.5	6.6	3.3	72.0	20.1	63.6		1	1	
Stable flies	42.0	11.7	0.0	55.2	41.1	14.4	12.0	0.7	4.5	1.8	0.0				
Wettable Chlordane 2.0 per cent															
House flies	3.9	3.6	6.0	10.8	0.9	0.6	12.9	9.6	53.4	18.0	134.7		1	1	
Stable flies	106.8	17.4	3.0	77.1	93.6	38.4	48.3	1.8	27.3	0.3	2.4				

(1944), Brett & Fenton (1946) and Stage (1947).

Reports on the effectiveness of DDT for the practical control of house flies and stable flies are far too numerous to cite here. There have, however, been few previous reports on the practical effectiveness of chlorinated chemicals, other than DDT, in the control of house flies and stable flies. Sweetman (1947) obtained comparable practical control periods with dichlorodiphenyl dichloroethane and DDT while Bruce & Decker (1947) reported that no practical difference in fly reduction occurred between chlordan, dichlorodiphenyl dichloroethane and DDT used on dairy farms and animals.

Tables 1 and 2 present the data accumulated for the past two seasons on the comparative practical effectiveness of DDT, methoxychlor, dichlorodiphenyl dichloroethane chlorinated camphene and chlordan. Piperonyl butoxide-pyrethrin was used in the 1948 tests as a non-residual fly spray.

All of the chlorinated chemicals used in these tests seemed to be about equal in effectiveness against house flies. Apparent differences between the residual chemicals are readily referable to variations in sanitary practices on the test farms. For example dichlorodiphenyl dichloroethane in 1947 gave a comparatively short control period on house flies whereas chlordan in 1948 gave a comparatively long con-

trol. An examination of the sanitation data, however, shows that one of the two barns treated with dichlorodiphenyl dichloroethane in 1947 had the only poor sanitary rating given during that season whereas chlordan was used on the only three farms rated with excellent sanitation in 1948.

Although all of the chlorinated chemicals tested appeared to depress the stable fly population, the control obtained is not believed to be economical. An apparent control of less than 2 weeks duration was recorded in 1947. This reduction in population could not, however, be attributed entirely to the chemical treatments as a marked fall in the mean temperature occurred coincident with the population drop. In 1948 the control period appeared to last for 2 and 3 weeks. Again the population depression was preceded by a drop in the temperature. Further doubt concerning the efficiency of the treatments on stable fly populations is raised by the fact that the seasonal population peaks obtained immediately following apparent chemical control occurred during seasonal peaks of the mean temperature and 1 to 2 weeks after the heaviest weekly rainfall of each season.

Many entomologists, including the present authors, have followed the findings of Bruce & Blakeslee (1946) in recommending complete premises treatments over barn or spot treatments. It is, in fact,

Table 2.—Effect of residual barn and premises treatments on fly populations in the milking rooms and directly connecting loafing rooms and sheds in 1948.¹

TREATMENT	MEAN NUMBER OF TRAPPED FLIES PER HANGING SQUARE FOOT IN 24 HOURS												FARM SANITATION			
	Treatment Date															
	June 14															
	June			July				August					Poor	Fair	Good	Excel.
Fly Species	8	21	28	5	12	19	29	2	9	16	23					
Wettable DDD																
2.0 per cent																
House flies	11.4	21.0	3.9	14.7	16.8	25.5	20.4	91.5	39.0	39.0	36.0		4		2	
Stable flies	15.0	9.1	3.9	32.4	27.3	43.8	9.3	1.8	0.6	6.0	20.7					
Wettable DMDT																
2.0 per cent																
House flies	2.7	3.6	3.6	6.3	9.3	4.8	24.6	21.6	18.0	79.2	48.9	1	3		2	
Stable flies	3.1	2.1	1.2	26.7	19.2	10.8	6.3	6.3	0.9	3.6	40.5					
Emulsion Chlorinated Camphene																
2.0 per cent ²																
House flies	12.4	7.9	4.6	11.5	5.5	8.6	4.4	10.2	26.2	86.2	30.5		4		3	
Stable flies	14.2	6.1	7.6	61.5	45.7	35.9	12.0	3.1	3.0	4.8	20.6					
Wettable DDT																
2.0 per cent																
House flies	5.2	2.5	2.1	3.6	7.8	11.4	35.4	36.0	43.8	40.5	72.6	3	3		1	
Stable flies	8.1	3.3	1.2	21.6	20.4	1.8	4.2	1.8	2.1	2.4	27.6					
Wettable Chlordane																
2.0 per cent																
House flies	10.2	2.4	0.6	6.9	6.0	6.9	4.5	2.7	6.6	28.2	22.8	1			2	
Stable flies	23.4	24.6	1.5	48.9	40.0	43.8	21.0	3.3	6.3	7.2	79.8				3	
Wettable Piperonyl butoxide-pyrethrum																
0.25 per cent																
House flies	4.5	13.5	5.4	12.0	22.7	93.6	124.8	213.3	127.7	123.9	89.7	3	1		1	
Stable flies	11.1	5.4	0.6	91.5	37.1	10.1	14.7	1.5	1.8	7.8	40.5					

¹ Data on barn and premises treatments have been combined.² One barn treatment was made with a 25 per cent wettable powder.

logical to conclude that the treatment of all or nearly all of the apparent fly resting places on a farmstead will result in a better control of flies.

In order to obtain some local fly control figures, 20 of the farms included in the 1948 experiments were given complete premises treatments. The resultant data, expressed in means of the fly populations, are given in figure 5. Apparently premises treatments had no significant additional influence on the number of flies that enter the milking barns. This should not be considered to infer that such treatments would not be much more effective than barn or spot treatments in reducing fly numbers throughout the farmstead. There is a need for further extensive studies of the relation of fly migration and fly breeding grounds to the comparative effectiveness of chlorinated chemical residues as spot, barn and premises treatments. Flies migrating unknown distances from previously undiscovered breeding grounds have an important bearing upon the practicability of the three different types of treatment. If flies are, as shown by Hodge (1913), migrating long distances from known breeding sites to the animals and

Fig. 5.—Comparative efficiency of barn treatments and complete premises treatments with chlorinated chemical residues in controlling house and stable fly populations in milking rooms, Lancaster County, Nebraska, Summer, 1948.

thence to the farmstead, spot treatments of farm buildings and removal of the breeding media might give control. At the other extreme, flies moving locally from unknown breeding sites might be little affected even by premises treatments.

SUMMARY.—House fly populations on Nebraska farms increase in the presence of moderate to heavy rains, high temperatures and poor sanitation but decrease with a lack of rain, low temperatures and excellent sanitation. Good fly breeding and development weather and the pres-

ence of adequate breeding media mask the effect and reduce the efficiency of chlorinated chemical residues. Stable flies are similarly affected by weather but do not appear to be strongly influenced by farm sanitation. Under comparable practical conditions DDT, dichlorodiphenyl dichloroethane, methoxychlor, chlorinated camphene and chlordan all seem to give a

comparable control of house flies and stable flies. Chlorinated chemicals used as residual building treatments do not give an effective control of stable flies at the dilutions used. Barn and premises treatments seem to be equally effective in reducing the number of house flies and stable flies that enter the milk barns on treated farms.

LITERATURE CITED

- Bishopp, F. C. 1913. The stable fly (*Stomoxys calcitrans* L.) an important livestock pest. *JOUR. ECON. ENT.* 6: 112.
- Bishopp, F. C. 1939. The stable fly, how to prevent its annoyance and its losses to livestock, U.S.D.A. Farmers' Bul. 1097: 1-18.
- Bishopp, F. C., W. E. Dove and D. C. Parman. 1915. Notes on certain points of economic importance in the biology of the house fly. *JOUR. ECON. ENT.* 8: 51.
- Blakeslee, E. B. 1944. DDT as a barn spray in stable fly control. *JOUR. ECON. ENT.* 37(1): 134-5.
- Blakeslee, E. B. 1945. DDT surface sprays for control of stable fly breeding in shore deposits of marine grass. *JOUR. ECON. ENT.* 38(5): 518-52.
- Brett, C. H., and F. A. Fenton. 1946. DDT as a residual insecticide for fly control in barns. *JOUR. ECON. ENT.* 39(3): 397-9.
- Bruce, W. G., and E. B. Blakeslee. 1946. DDT to control insect pests affecting livestock. *JOUR. ECON. ENT.* 39: 367-74.
- Bruce, W. N., and G. C. Decker. 1947. Fly control and milk flow. *JOUR. ECON. ENT.* 40(4): 530-6.
- Hodge, C. F. 1913. The distance house flies, blue bottles, and stable flies may travel over water. *Science*, Oct. 10: 512.
- Howard, L. O. 1906. House flies. U. S. Dept. Agri., Bur. Ent. Circ. 71.
- King, W. V., and Louva G. Lenert. 1936. Outbreaks of *Stomoxys calcitrans* (L.) ("dogflies") along Florida's northwest coast. *Fla. Ent.* 19: 33-9.
- Muma, Martin H., and Ephraim Hixson. 1948. Barn sprays for house fly and stable fly control. *Nebr. Agr. Expt. Sta., Ann. Rept.* 61: 57.
- Simmons, S. W. 1944. Observations on the biology of the stable fly in Florida. *JOUR. ECON. ENT.* 37(5): 680-6.
- Simmons, S. W., and W. E. Dove. 1941. Breeding places of the stable fly or "dogfly," *S. calcitrans* L., in northwestern Florida. *JOUR. ECON. ENT.* 34(3): 457-62.
- Simmons, S. W., and M. Wright. 1944. The use of DDT in the treatment of manure for fly control. *JOUR. ECON. ENT.* 37: 135.
- Stage, H. H. 1947. DDT to control insects affecting man and animals in a tropical village. *JOUR. ECON. ENT.* 40(6): 759-62.
- Sweetman, Harvey L. 1946. DDT as a spot treatment for flies. *JOUR. ECON. ENT.* 39(3): 380-1.
- Sweetman, Harvey L. 1947. Comparative effectiveness of DDT and DDD for the control of flies. *JOUR. ECON. ENT.* 40(4): 565-6.
- Tate, H. D., and Martin H. Muma. 1946. DDT and fly control. *Nebr. Agr. Expt. Sta., Ann. Rept.* 59: 61-63.
- Van Leeuwen, E. R. 1944. Residual effect of DDT against house flies. *JOUR. ECON. ENT.* 37(1): 134.
- Wiesmann, R. 1943. Fly control in stables. *Soap and Sanitary Chem.* 19(12): 117, 119, 141, 143. (Translation.)

OSCAR MONTE

In *Rev. Brasil. Biol.* 8(3): 411-2 we find a note contributed by A. M. da Costa Lima stating that Oscar Monte died on July 1, 1948, at his home in Belo Horizonte.

Born in 1895, Dr. Monte was formerly Professor of Entomology at Belo Horizonte and was more recently a member of the staff of the Instituto Biologico at San Paula. He was a great authority on the Tingitidae and was the author of numerous papers on other Hemiptera and on Coleoptera and Lepidoptera.

In 1928 Dr. Monte published the "Almanack Agricola Brasileiro" a work on the common names of insects in Brazil and in 1934 he published the manual "Borboletos que vivem em plantas cultivadas." His work on the Tingitidae was never completed.

J. L. CARTLEDGE