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PRESIDENTIAL ADDRESS [1]

MILLEDGE MURPHEY, JR.[2]

I do not know when the idea of the presidential address began, nor do I know any real reason for the president to address the membership of a society at the end of his term of office. This time-honored custom is apparently a necessary evil that we all have to bear. During the last few months I have pondered many times the words of Past President Butcher when he compared preparing the presidential address to the normal course of events associated with the birth of a baby, the momentary pleasure of conception (the honor of being elected president) which is shortly followed by the realization that the thing must be delivered within a few months. If you did not hear Dr. Butcher's address, I would certainly recommend your finding the December, 1955, issue of THE FLORIDA ENTOMOLOGIST and reading his wise and profound words. Certainly it is a must reading assignment if you are given the honor to direct the activities of our society for a year. And I assure you his well chosen words will bring much comfort during those wakeful hours of near hysteria that are sure to come during the development period.

The other day I mentioned to my family my quest for a subject for a presidential address and my older daughter, who is a teenager, asked, and about ways to cut the national budget, and he remarked that one good thing about a presidential address was that it could be one minute or one hour, and the president made the decision. I want to assure you that this address will be closer to the former than to the latter. And when a member of the program committee remarked just 30 days ago that so many papers had been received that he doubted if they would have time for a presidential address, I decided to cut my remarks in half.

Not long ago I was talking with an entomologist friend about taxes and about ways to cut the national budget, and he remarked that one agency he knew could certainly have its budget cut because half of the men working in it had no purpose. The thought of men or scientists having a purpose has returned to my mind many times since that conversation. Of course everyone has a purpose of some sort. Just being on hand from 8 to 5 waiting for the monthly pay check is a purpose, and this was probably the kind of purpose my friend was talking about. Such a purpose, with the long coffee break, with many bull sessions, and little completed work is catching and before long can seep throughout the best of organizations. It reduces the output of work and always breeds unhappiness and discontent. Usually the most discontented people are those that produce the least. A busy man is a happy man. And for an organization to develop and progress it must have a leader with a good purpose and with an enthusiasm that can be passed on to his fellow workers. The proper enthusiasm is catching and the young scientist is certainly fortunate who is assigned to work with a leader who has a drive and a purpose and not one who is resting on his laurels.

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[1] Presented at the Forty-second Annual Meeting, Florida Entomological Society, Miami, September 10-12, 1959.

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Just recently, Dr. J. Wayne Reitz, President of the University of Florida, wrote an article in which he estimated over two-thirds of the students entering the University had little or no idea what they wanted to take or what they wanted to do with their lives. I am sure Dr. Reitz was not taking into consideration the co-eds when he made his summary, because most co-eds know what they are trying to get from the University. This lack of decision on the part of the student can be translated into a lack of purpose. Many are going to college because it is the thing to do after finishing high school. During my 11 years of teaching I have counseled many students about courses, and it is discouraging to say that many take a college course for 3 hours credit and not to learn something about the subject. This same attitude is also found throughout the public high schools. "Take something easy so I can get my 20 credits to graduate." "Give me band and shop." Or, do as one high school senior I talked with this fall, was doing by taking 3 credits of mechanical drawing in which he already had one credit. No chemistry, physics, algebra, language; no, they are hard and he must graduate. You see, the purpose is to get 20 credits to graduate, not to get an education to prepare himself for college or a more purposeful and eventful life. It is certainly stimulating to an instructor to have several foreign students in his classes because these young men are here with a purpose and in addition to the credits, they want to know something about the subject. I do not want to give the impression that all students lack a purpose or that at a university all students are in this category. If you think back over your college courses, the good ones were those in which the professor had a definite purpose, and with that purpose he had enthusiasm in the subject that was catching to the student. The field of study of a good course was not nearly as important as the interest and attitude of the professor. He made the subject interesting, and you learned something. But the professor who read old notes in a sing-song manner, gave few tests, and turned his papers for grading and his laboratories over to the student assistant, lacked enthusiasm in what he was doing, and his students responded accordingly. Such a professor is actually worse than the 8 to 5 clock watcher because he is working with young people who need stimulation, encouragement, and an increased desire to do a good job. With the majority of our college students undecided as to their careers, a professor could have no greater challenge than he has today in teaching his chosen field.

We have many enthusiastic entomologists. Probably the most enthusiastic group are the collectors. When I was working for the State of Georgia, I had the pleasure of knowing and working with Professor P. W. Fattig of Emory University. P. W. Fattig was a collector. He spent most of his professional life collecting insects in Georgia. His aim was to collect every kind of insect living in Georgia, and his interest and enthusiasm never weakened. At one time he was interested in the genus *Phyllophaga* and for 15 years he combed the state, collecting members of this group. During this time he collected 70 species, including 17,967 specimens from 113 localities. One spring Fattig's records indicated that a given species of may beetle should be out in Toccoa, Georgia, a small mountain town. Wanting some additional specimens, the next weekend found Fattig in Toccoa. At 3 o'clock in the morning Fattig had climbed a light

pole and was collecting may beetles flying around a street light. The town constable came by and called out, "What are you doing up there?" Fattig, who was about 60 at the time, called back "I'm catching may beetles," and kept on swinging his net. Fattig said, "You know, that policeman thought I was crazy and tried to lock me up." Fattig published many articles on insects of Georgia. Emory University published 10 bulletins of his work. Fattig's enthusiasm was catching, and he must have stimulated many students into the fields of entomology and the biological sciences. I have had the pleasure of teaching two students who took entomology through contact with this collector.

We have devoted purposeful men and women in all fields of entomology. The taxonomist will spend hours and hours working in the field of his interest. At times the economic entomologist wishes the taxonomist would not be so enthusiastic in his desire to name new species and create new genera because of the difficulty of keeping up. In research, commercial work, and manufacturing, we find scores of men dedicated to our science.

The Florida Entomological Society has a purpose. It is written into our constitution. Article 1, Section 2. reads: "The objectives of the Society shall be: (1) to promote the study of entomology; (2) to encourage research relative to insects and related arthropods in Florida; (3) to distribute widely knowledge pertaining to insects; and (4) to publish THE FLORIDA ENTOMOLOGIST". The Society during the past two years has placed much emphasis on the first objective. The "Entomology in Action" talk prepared by Mr. Wright has stimulated much interest in Florida and other states. The exhibit, which is on display for the first time at this meeting, should encourage young people to take an interest in entomology. Our publication THE FLORIDA ENTOMOLOGIST, under the direction of Dr. Berner, is distributed throughout the world and continues to be an outstanding entomological publication. Research in entomology and related arthropods is certainly encouraged by THE FLORIDA ENTOMOLOGIST.

I believe we have a bright future in entomology in Florida. Our profession is respected and the number employed in entomology in Florida continues to increase year by year. Student interest both in the undergraduate and graduate programs of study continutes to be high. The teaching plant at the University is an exceptional one with ample space for instruction and research. If you have not visited the new quarters of the teaching department, do so the next time you are in Gainesville. You will be amazed at our facilities. In the near future the 4-H Club entomology program will interest many young people in our science and should encourage increased enrollment in entomology at the college level. The papers to be given at this meeting clearly indicate that entomology in Florida is moving forward in rapid strides with many benefits to agriculture and mankind. The future of our science has never been brighter. Reexamine your purpose and continue to strive towards its fulfillment.

HYMENOPTEROUS PARASITES OF CHRYSOPIDAE ON FLORIDA CITRUS [1]

MARTIN H. MUMA [2]

Chrysopidae, or green lacewings, are common to abundant in many Florida citrus groves. Because of their large size and common occurrence, citrus growers frequently observe chrysopids and make inquiries concerning their importance as natural control agents. Little is known, however, concerning the activities of these predators under Florida grove conditions. A recent systematic survey has demonstrated that 3 genera and 10 species may be found on citrus trees, but only 4 trash-bearing and 1 naked species are common (Muma, 1959). Host specificity, as indicated by nutritional limitations, has been studied for 1 species under laboratory conditions (Muma, 1957). The present report gives the results of parasite rearings accumulated from chrysopids over a 4-year period, from 1952 to 1956.

METHODS

All of the parasites reported here emerged from cocoons that were collected at random from leaves, fruit, limbs and trunks of citrus trees in all of the major citrus producing areas. No predetermined number of cocoons was collected per grove; 150 samples varied from 1 to 57 cocoons. Each cocoon was isolated in a cotton-stoppered vial and retained at room temperature until emergence occurred or until it became obvious that no emergence would occur. Specimens were then preserved in 70 percent ethyl alcohol pending identification.

Host identifications were based on characteristics of the larval palpi and head capsule within each cocoon and correlated with adult identifications made by Dr. Willim E. Bickley and Dr. Ellis G. MacLeod of the University of Maryland. Parasite identifications were made by direct comparison with specimens identified by specialists of the United States National Museum.

Although many adult chrysopids and eggs were collected under grove conditions and confined in the laboratory for observation, no special effort was directed toward the rearing and identification of parasites of these life stages. On several occasions, however, mites of the family Erythraeidae were noted clinging to adult lacewings, and several specimens of *Telenomus chrysopae* Ashm. were reared from eggs. Similarly, no systematic investigation was conducted on first and second instar larvae. Numerous grove-collected larvae were reared to the adult stage in the laboratory, but no parasites issued from the specimens.

RESULTS

Altogether 1,156 cocoons were collected between April 14, 1952, and July 12, 1956. Table 1 shows the number and percentage of cocoons from which adult chrysopids or parasites emerged or from which no emergence was obtained. The percent parasitism calculated for the trash-bearing

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TABLE 1. ADULT AND PARASITE EMERGENCE AND UNKNOWN MORTALITY OF CHRYSOPID COCOONS COLLECTED AT DIFFERENT SEASONS IN FLORIDA CITRUS GROVES FROM 1952 TO 1956.

Seasons	No. Collections	No. Cocoons	Emergence			Percent		Unknown Mortality
			Adults	Parasites	None	Emerged	Parasitized	
Trash-bearing species: 2 genera, 5 species.								
Spring	51	294	69	56	169	23.5	19.0	57.5
Summer	73	674	150	119	405	22.3	17.7	60.1
Fall	2	29	0	3	26	0.0	10.3	89.7
Winter	7	40	6	9	25	15.0	22.5	62.5
Naked species, Chrysopa rufilabris Burm.								
Spring	10	84	56	12	16	66.7	14.3	19.0
Summer	7	35	12	4	19	34.3	11.4	54.3
Fall	—	—	—	—	—	—	—	—
Winter	—	—	—	—	—	—	—	—

species averaged 17.3 percent whereas that for *Chrysopa rufilabris* Burm., the only naked species reared in the study, averaged 12.8 percent. These are low rates of parasitism when compared with published records of 48.4 percent for *rufilabris* on cotton (McGregor, 1914), 50.0 percent for *rufilabris* and *C. plorabunda* Fitch on peach (Putnam, 1937), 26.7 percent for *C. harrisii* Fitch on Australian pine (Judd, 1949), and a range of 75.9 percent on walnut, 69.6 percent on cotton, 37.3 percent on orange, and 27.5 percent on apple for *C. californica* (Clancy, 1946). However, the percent parasitism calculated in this study was based on total collected cocoons, a method previously utilized only by Putnam (1937). It should also be noted that a seasonal range of 10.3 to 22.0 percent parasitism has been calculated for the trash-bearing species studied here. This variation in parasitism was not associated with chrysopid abundance, as indicated by the number of collections or the number of cocoons per collection, as was reported from California by Clancy (1946). Furthermore, the percent of cocoons failing to produce host insects or parasites had no relationship to percent parasitism. The different results obtained in this study may have been due to the smaller number of cocoons collected or possibly to environmental differences between the two geographic localities. The percent parasitism of the naked species, *rufilabris*, was relatively constant in the two seasons when the species was common, but the percent failing to emerge increased sharply in the summer, after which the species could not be obtained in numbers.

Consideration of parasitism on a specific level demonstrated a definite relationship between the species of chrysopids and the parasites attacking them, a phenomenon previously recorded by Clancy (1946). Table 2 presents data showing these relationships. *Chrysopa cubana* Hagen, the most common trash-bearing chrysopid on citrus, was more heavily parasitized by the primary parasites *Isodromus iceryae* Howard and *Otacustes crassus chrysopae* Ashmead, *C. sanchezi* Navas by *I. iceryae*, *C. bimaculata* McClendon by *I. iceryae*, and *Brachycyrtus pretiosus* Cushman, and *C. rufilabris* by *O. c. chrysopae*. The known heterogeneity of the series of cocoons that could not be placed to species was indicated in the heterogeneity of primary parasites. Secondary parasitism was remarkably low with the known hyperparasite, *Chrysopophagus compressicornis* Ashmead, attacking less than 5 percent of any host species, and the same was true for the suspected hyperparasite *Horismenus* sp.

Two cocoons of *Nodita floridana* Banks were collected during the study. Both were parasitized, one by *I. iceryae* and one by *Anastatus* sp.

Among the solitary primary parasites, *O. c. chrysopae*, the most common, was reared from 59 cocoons, *B. pretiosus* from 27, *Anastatus* sp. from 8, and *Otacustes bicolor* (Cushman) from 2. Of the two greagrious primaries, *I. iceryae* emerged from 59 cocoons and *Tetrastichus chrysopae* Crawford from 3. Because of the small number of cocoons infested, no mode of emergence per cocoon could be calculated for *chrysopae*, but the mode for *iceryae* was 4 specimens per cocoon. The most common known hyperparasite was *C. compressicornis* which emerged from 19 cocoons; *Arachnophaga* sp. emerged from only 1. The former, a gregarious species, had a mode of emergence of 8 specimens per cocoon, the latter was solitary. *Horismenus* sp., a suspected hyperparasite, emerged from 30 cocoons and

TABLE 2. PARASITISM OF COMMON SPECIES OF *Chrysopa* LEACH ON FLORIDA CITRUS FROM 1952 TO 1956.

Host species	Number living specimens	Percent emerged as		Percent parasitized by						
		Adults	Parasites	*Isodromus iceryae*	*Octacustes crassus*	*Brachycyrtus pretiosus*	*Chrysopophagus compressicornis*	*Horismenus* sp.	*Anastatus* sp.	Misc. spp.*
Chrysopa cubana Hagen	179	63.1	36.9	12.3	12.3	3.4	3.9	3.4	0.6	1.2
C. sanchezi Navas	48	66.7	33.7	25.0	2.1	2.1	0.0	2.1	0.0	2.1
C. bimaculata McClendon	11	54.5	45.5	18.2	9.1	18.2	0.0	0.0	0.0	0.0
C. undetermined (Trashy)**	174	44.3	55.7	10.9	12.6	10.3	5.2	13.2	1.1	2.2
C. rufilabris Burm.	84	81.0	19.0	0.0	15.5	0.0	3.6	0.0	0.0	0.0

* Includes *Tetrastichus chrysopae* (Cwfd.), *Otacustes bicolor* (Cush.) *Arachnophaga* sp., and an undetermined parasite.
** Host larvae could not be determined owing to decomposition or fungus overgrowth.

proved to be gregarious with a mode of 8 specimens per cocoon. One undetermined species of wasp emerged from 2 cocoons.

Summary and Discussion

Eleven species of parasites were reared from 1,156 chrysopid cocoons collected in citrus groves from 1952 to 1956. Two genera and 6 species of chrysopid hosts were represented in the collections, but only 4 trash-bearing and 1 naked *Chrysopa* were common enough to study. A certain degree of host specificity was exhibited by the 3 common primary parasites. Hyperparasitism by 2 known and 1 suspected hyperparasites was low.

No relationship could be demonstrated between chrysopid numbers and rates of parasitism. However, Chrysopidae are much more common in citrus groves in the spring and summer, and sharp population decreases in the fall and winter usually occur following an increase of an unknown mortality within the cocoon. The existence of an undetermined natural control factor is suspected.

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CATTLE GRUB CONTROL WITH BAYER 21/199 IN THE EVERGLADES [1]

EMMETT D. HARRIS, JR., W. G. GENUNG, AND C. E. HAINES [2] [3]

Harris, Genung, and Chapman (1959)[4] reported that a single application of Bayer 21/199 (Co-ral) was superior to one of ronnel (Trolene) when applied in May, June, July, or August to control the common cattle grub, *Hypoderma lineatum* (DeVill.). When each chemical was applied in September, ronnel was superior. They also stated that the number of grubs observed in the backs of cattle is much lower than in other areas of the United States, but the pest appears to be potentially of much greater importance. Although the peak of population was during the winter, animals with grubs encysted in the back had been found in every month but June and the common cattle grub could become a year round pest in the Everglades. A single application of either chemical probably would not be effective throughout the year if the cattle grub population were larger.

The primary purpose of this experiment was to compare 2 applications of Bayer 21/199 (in June and September) with single applications in June or September.

Applications were made by spraying a 0.5 percent wettable powder suspension of Bayer 21/199 at 100 psi over the back until run-off occurred. The nozzle was held about 1 foot from the animal's back. Application rates were approximately 0.65 and 0.67 quarts per animal for sprays applied on June 22 and September 12, 1958, respectively.

The numbers of cattle grubs encysted in the back of each animal were determined September 12 and November 19, 1958, and January 28 and March 25, 1959, by feeling for the resulting bumps under the hide. Among the animals examined were 10 steers and 12 heifers that were treated June 22, 10 steers and 8 heifers that were treated June 22 and September 12, and 11 steers and 12 heifers that were treated September 12. All were Brahman x Devon yearlings. In addition, 22 untreated steers and 19 untreated heifers of Brahman, Devon, Brahman and Brahman x Angus breeding were examined on each date. No animal had grubs encysted in the back on September 12. The average number of grubs per animal for untreated steers was 7.3 November 19, 14.3 January 28, and 5.1 March 25. Among untreated heifers the values were 4.4, 13.5 and 5.2 on the respective dates.

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[1] Florida Agricultural Experiment Station Journal Series, No. 930.

[2] Assistant Entomologist, Associate Entomologist, Assistant Animal Husbandman, respectively, Everglades Experiment Station, Belle Glade, Fla.

[3] The authors are indebted to Mr. Edward King, Jr., Draftsman, and Mr. Henry Ruffolo, Staff Assistant, for preparation of the graphs and to Mr. C. E. Seiler and Mr. A. B. Jimmerson, Field Assistants, for assistance in conducting this experiment.

[4] *Harris, Emmett D., Jr., William G. Genung,* and *Herbert L. Chapman, Jr.* 1959. Comparison of two systemic insecticides and dates of application for cattle grub control in the Everglades. Journ. Econ. Ent. 52: 425-428.

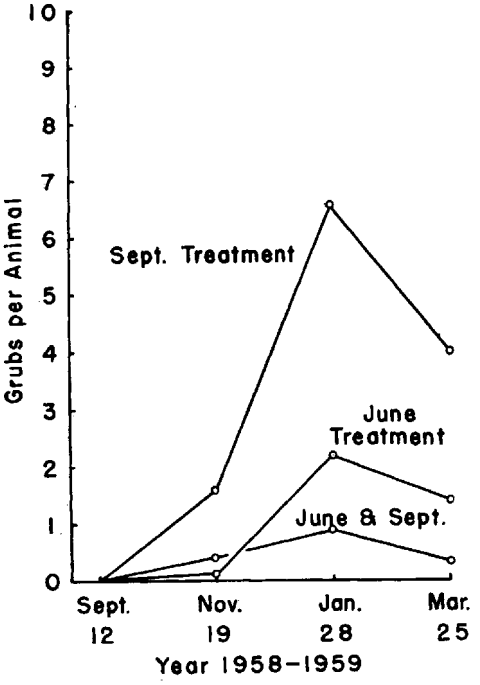

Fig. 1

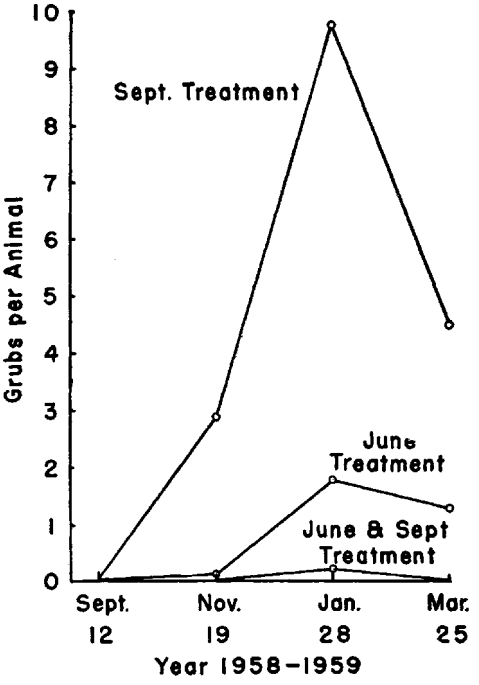

Fig. 2

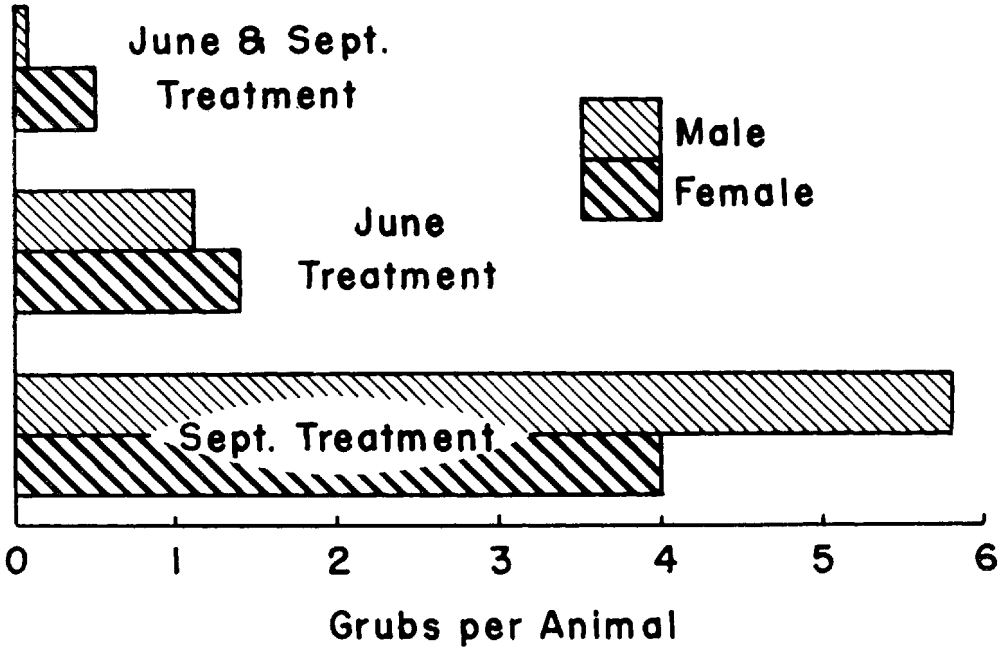

Fig. 3

Fig. 1. The effect of treatment date on common cattle grub control with Bayer 21/199 on Brahman x Devon heifers by observation dates.

Fig. 2. The effect of treatment date on common cattle grub control with Bayer 21/199 on Brahman x Devon steers by observation dates.

Fig. 3.—Seasonal effect of treatment date on common cattle grub control with Bayer 21/199 on Brahman x Devon cattle.

When the average numbers of grubs per animal over the observation period were compared for 9 steers and 9 heifers for untreated Brahman x Angus crossbreeds, the steers had significantly more (8.7) than the heifers (6.1). Also for the September treatment, heifers had significantly fewer grubs than the steers. As steers and heifers were not divided proportionately among the treatments, it seemed preferable to compare the treatments within each sex.

The average number of grubs for each treatment on each observation date is shown for heifers (Figure 1) and steers (Figure 2). On any one observation date, there were no significant differences among the treatments applied to heifers. On November 19, January 28, and March 25, significantly more grubs per steer resulted from the September treatment than from the other 2 treatment dates. When the observation dates were averaged to get a seasonal value for the number of grubs per animal, both the June treatment and the combination June and September treatments were significantly more effective than the September treatment for each sex (Figure 3). The difference between the June treatment and the combination June and September treatment was not significant and probably would not be economically important. The difference between the treatments might be much larger if the cattle grub population had been larger. Unless the population of cattle grubs becomes larger in the Everglades, 1 application of Bayer 21/199 during June seems to be sufficient.

NOTICE

The Forty-Third Annual Meeting of The Florida Entomological Society will be held in Jacksonville at the Robert Meyer Hotel on September 8-9, 1960. The program committee has been appointed and will begin planning in the near future for an outstanding session.

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ECOLOGY OF THE PINE SAWFLY, *NEODIPRION EXCITANS* (ROHWER) (HYMENOPTERA, DIPRIONIDAE)

L. A. HETRICK [1] [2]

Rohwer (1921) described the sawfly, *Neodiprion excitans*, from a locality in southeastern Texas on the basis of adults reared from cocoons sent to him. Craighead (1950) briefly mentions the species as occurring on loblolly and shortleaf pines from the Carolinas to Texas. Ross (1955) confirmed the validity of *N. excitans* and discussed its evolution. Life-history notes on a single group of *Neodiprion excitans* larvae were recorded by Hetrick (1956) but other references to the species are obscure.

In the autumn of 1957, *Neodiprion excitans* larvae caused noticeable defoliation of loblolly pine trees (*Pinus taeda* L.) in north-central Florida including parts of Alachua, Columbia, Gilchrist, Levy, and Suwannee Counties. The usual, native, sawfly, natural enemies were observed to be present in the infested areas visited in the autumn of 1957. Very few biological data were obtained at this time as it was assumed that abundant material would be available for study in these areas in the spring of 1958; however, only a few groups of larvae were found during this period and rearing work with them ended in failure.

Late in the summer of 1958, *Neodiprion excitans* was causing defoliation of loblolly pine over approximately 300,000 acres of woodlands in Dixie and Taylor Counties. It is questionable how many generations of the insect occurred in 1958 in this area prior to the beginning of biological studies in October. Also it is not known whether there was any noticeable build-up and defoliation in these areas in 1957. It is interesting to note that this same sawfly caused fairly extensive defoliation in southeastern Texas, the type locality of the species, in the autumn of 1958 (Robert C. Thatcher, U. S. Forest Service, personal correspondence).

Biological studies in the woods near Athena, Taylor County, Florida, showed an emergence of adult sawflies early in October 1958. Eggs were laid on the terminal needles—typically 1 egg per needle, inserted just above the needle sheath. Ghent & Wallace (1958) predicted this oviposition pattern on the basis of studies with a closely related Canadian species, even though they had never seen *N. excitans*. Occasionally more than 1 egg per needle was observed but this is believed to be due to more than 1 female using the same cluster of terminal needles for oviposition. Although most of the eggs were laid in needles of loblolly pine, *Pinus taeda* L., some were laid on longleaf pine, *Pinus palustris* Mill., and only a few

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[2] The author wishes to thank the Florida Forest Pest Committee for making travel funds available. Mr. Walter Beers, Buckeye Cellulose Corporation, Mr. Vaughan McCowan, Florida Forest Service, and Dr. Alvah Peterson, Florida State Plant Board, provided able assistance in the studies. Dr. John T. Creighton, Head, Department of Entomology, University of Florida, arranged the writer's teaching schedule to allow time for the studies.

eggs were observed in needles of slash pine, *Pinus elliotti* Engelm. A copious flow of resin from oviposition scars on needles of slash pine apparrently greatly reduced the number of eggs hatching on trees of this species.

Eggs required about 3 weeks to hatch during the warm autumnal days and cool nights. Larval feeding and development of this generation was retarded by seasonal conditions. A few larvae were still feeding on the pine foliage early in January 1959. Transformation to the non-feeding prepupal stage takes place on the trees before silken cocoons are spun. Most cocoons are found in the litter or in the soil but others may be attached to needles, bark, or nearby low-growing vegetation. Most of the time spent in the cocoons is in the prepupal stage. Once transformation to the pupal stage occurs, development to adults takes place within 2 to 3 weeks. A definite diapause occurs as prepupae within cocoons but the duration of this diapause has not been determined.

The spring generation of *N. excitans* provided more information on the life-history of the species. Adult emergence, mating, and oviposition took place during the latter part of March 1959. On emergence, adult females appear to have their full complement of developed eggs within their abdomens. The eggs are a light green visible through the abdominal walls of the females. McCowan counted eggs in the abdomens of randomly selected females and found a range of from 5 to 135, with the average being 67 eggs per female. Eggs were laid in the basal portion of established needles, 1 per needle, just above the needle sheath.

Eggs hatched in approximately 10 days. The first larval instar required 6 days. The second, third, and fourth larval instars each required approximately 10 days of active feeding on pine foliage. Larvae transformed to prepupae after 4 feeding instars. Differences in size of larvae could be observed in all instars beyond the first; it is believed that the smaller larvae will produce male adults and the larger larvae will produce female adults.

The population of *N. excitans* declined in the infested areas during the course of the studies. After the first generation in 1959, insufficient material was present in the woods to justify a continuation of the studies. It is definitely known that *N. excitans* is a multiple generation species. Judging from the duration of the first generation in 1959 and information obtained during the autumn of 1958, there may be as many as 4 or 5 generations per year under Florida conditions. In past seasons, defoliation has not been sufficient to attract attention until early autumn. This fact suggests that the insect builds up a population during the spring and summer months with a peak being reached in September and October. The possibility that the undetermined diapause may have something to do with peak autumnal populations should not be disregarded.

The decline of the outbreak in Taylor County afforded an opportunity to study factors in the natural control of *N. excitans*. During the autumn and winter months, shrews were active in the soil and litter under infested trees; it is assumed that these mammals destroyed many sawfly cocoons. At the time of spring emergence of adult sawflies, adults of the tree swallow, *Iridoprocne bicolor* (Viellot), were in flight over infested woodlands; it is assumed that these birds were feeding on flying adult sawflies.

Insect predators of *N. excitans* included a heavy population of the wheel bug, *Arilus cristatus* (L.), and a pentatomid bug, *Podisus fretus* Olsen. Other species of reduviid and pentatomid bugs were present but in lesser numbers. Spiders exerted some influence as predators of the adult sawflies.

Two species of parasites of the eggs of *N. excitans* were recovered. These were *Closterocerus cinctipennis* Ashm. and *Tetrastichus* sp. (Hymenoptera, Eulophidae).

The following parasites emerged from cocoons of *N. excitans*. *Spathimeigenia spinigera* Tns. and *Phorocera* sp. (Diptera, Larvaevoridae); *Villa sinuosa* (Weid.) (Diptera, Bombyliidae); *Endasys subclavatus* (Say), *Agrothereutes lophyri* (Nort.), and *Exenterus canadensis* Provancher (Hymenoptera, Ichneumonidae); *Perilampus hyalinatus* (Say) (Hymenoptera, Perilampidae); and *Dibrachys cavatus* (Walk.) (Hymenoptera, Petromalidae). Quite likely the last two species are secondary parasites.

Late in 1958, larvae of *N. excitans* were observed dying on trees where they had been feeding. Examination of these larvae indicated the presence of a polyhedral disease. Although great numbers of larvae were not observed to be dead from this disease, it is possible that the disease killed many in the first and second instars and contributed to the decline of the outbreak.

An abundance of rainfall during the winter and spring months appeared to have aided in natural control. The loblolly pine grows in many low areas. Standing water on these sites could be expected to have two effects on sawfly cocoons in the soil and litter. These are the direct effect of drowning or smothering and the indirect effect of stimulating diseases of prepupae within cocoons.

Low temperatures during the winter of 1958-1959 had little effect on the sawfly population. Larvae still feeding on the trees in December and early January experienced some nights with temperatures below freezing. Feeding activity was resumed with the advent of favorable temperatures.

It was noted that defoliation of loblolly pine by *N. excitans* has not resulted in the death of the attacked trees. Although many trees were bare of foliage during the winter months, these trees were not attacked by bark beetles. Trees defoliated in certain areas in the autumn of 1957, and those in other areas defoliated in 1958 resumed normal foliage development in the spring of the following years. Because of the various factors in natural control of the insect, it appears unlikely that defoliation will occur in the same area for more than a single season.

Summary

The sawfly, *N. excitans*, is mainly a defoliator of loblolly pine. Oviposition occurs on established pine needles with 1 egg per needle just above the needle sheath. In the spring of 1959, eggs hatched in approximately 10 days. The 4 larval feeding instars require approximately 10 days each. Most prepupae spin cocoons in the litter and soil but some are found on pine needles, on bark, or on low growing vegetation. This is a multiple-generation species but the number of generations per year has not been determined. Important factors in natural control are insect parasites, predators, polyhedral disease, and excessive rainfall.

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BUDWORM CONTROL STUDIES ON SWEET CORN IN THE EVERGLADES [1, 2]

EMMETT D. HARRIS, JR.[3]

One quart of 25 percent DDT emulsifiable concentrate (0.5 pound actual toxicant) and 2.5 pounds of 40 percent toxaphene wettable powder (1.0 pound actual toxicant) per 100 gallons of spray were recommended for the control of budworms on sweet corn in Florida (Anonymous, 1956; Kelsheimer *et al.*, 1950). In recent years it became apparent that these treatments were not controlling budworms effectively. Many Everglades sweet corn growers either increased the dosages or used heptachlor, toxaphene, or DDT in combination with parathion. It seemed necessary to re-evaluate the recommended chemicals and compare them with other insecticides in common use.

Data reported by Hayslip and Genung (1950), Kelsheimer *et al.* (1950), and Wene (1954) indicated that parathion effectively controlled budworms on corn. Wilson (1949) reported that 1 quart of 25 percent DDT emulsifiable concentrate was superior to 1 pound of 15 percent parathion wettable powder in 100 gallons of spray. Hayslip and Genung (1950) reported that DDT emulsion was superior to toxaphene emulsion or wettable powder suspension. Wene (1954) reported that parathion and DDT at 0.25 and 1 pound per acre, respectively, were slightly more effective than toxaphene at 1 pound for the control of budworms on sweet corn. He reported effective control with heptachlor, toxaphene, and parathion. Kelsheimer (1951) reported that heptachlor gave excellent budworm control. At present, DDT is recommended at 2 pounds of 50 percent wettable powder and toxaphene at 4 pounds of 40 percent wettable powder per 100 gallons (Brogdon and Marvel, 1959).

In each experiment plots were 2 rows wide, 50 feet long and separated by single unsprayed buffer rows. Sixty-Pak sweet corn was planted in rows that were 36 inches apart. Treatments were applied with a custom-made self-propelled small plot sprayer with an outrigger boom equipped to spray 2 rows (Harrison *et al.* 1958). Sprays were applied weekly. Initial spray applications were made with 2 overhead nozzles to each row. Nozzles were added to drops between the rows to give complete coverage as the corn grew taller. Sprays were applied at the rate of 25 gallons per acre per nozzle or 50, 100, and 150 gallons per acre, respectively, with 2, 4, and 6 nozzles per row.

PHOSPHATES, CHLORINATED HYDROCARBONS, AND COMBINATIONS OF PHOSPHATES AND CHLORINATED HYDROCARBONS

An experiment was conducted to compare toxaphene, DDT, heptachlor, parathion, and phosphamidon and to determine if combinations of parathion

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[2] The author wishes to thank Mr. A. B. Jimmerson, Field Assistant, for assistance in conducting the experiment, Mr. Edward King, Jr., Draftsman, for preparing the figures, and Mr. Henry Ruffolo for the photography.

[3] Assistant Entomologist, Everglades Experiment Station.

or phosphamidon with the other materials were more effective than the respective insecticides when applied alone.

All of the insecticides were applied in emulsions. Parathion and phosphamidon were applied at the dosage of 0.25 pound of actual toxicant per 100 gallons of spray, using an emulsifiable concentrate that contained 4 pounds of actual toxicant per gallon. DDT and heptachlor emulsifiable concentrates that contained 2 pounds of actual toxicant per gallon were used to make emulsions that contained 0.5 pound of actual toxicant per 100 gallons. The toxaphene emulsifiable concentrate contained 6 pounds of actual toxicant per gallon and was used in sprays that contained 1 pound of actual toxicant per 100 gallons. Each treatment was replicated 4 times in a randomized complete block design.

Sprays were applied at 150 psi using 8002 Spraying Systems Teejet nozzles with the sprayer driven at approximately 2.4 mph. The first spray application was made October 21 to corn that had been planted October 7, 1958. The first 2 sprays were applied with 2 nozzles over each row. A nozzle was added to each side of the row for the next 2 applications. The last 2 sprays were applied with a second nozzle added to each side of the row.

An examination for budworm damage was made on all of the plants in each plot on the fourth day following each of the 6 weekly applications. Those plants showing evidence of recent budworm feeding in the whorl, or at the top of the plant, were considered damaged. On October 10 and 11, 100 larvae were collected from unsprayed buffer rows and all were identified as the fall armyworm, *Laphygma frugiperda* (J. E. Smith).

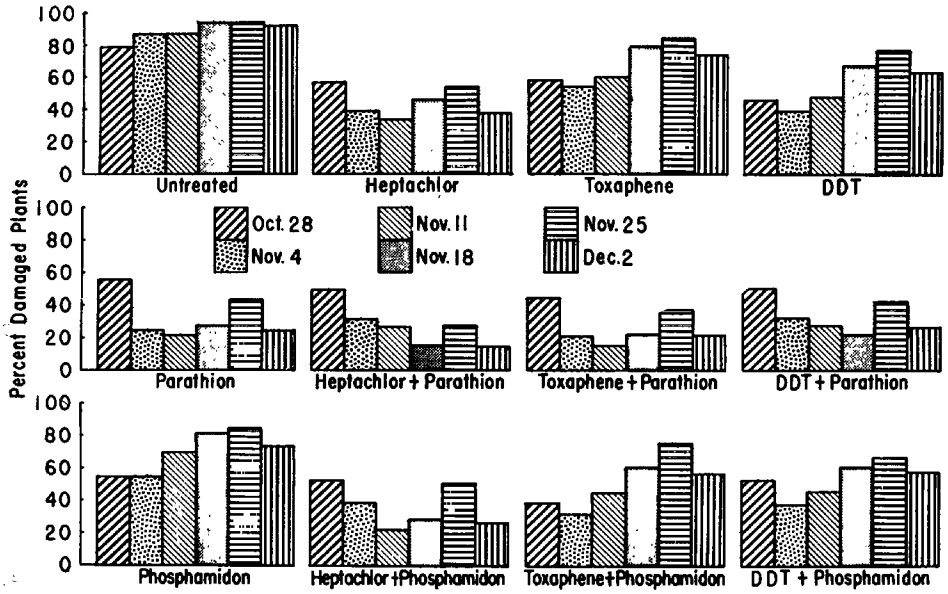

Fig. 1. Control of budworms on sweet corn on 6 dates with phosphates, chlorinated hydrocarbons, and combinations of phosphates and chlorinated hydrocarbons.

The results for each observation date are shown in Figure 1. Treatments were compared by the Student-Newman-Keula test (Federer, 1955).

After the first spray, treatments were not significantly different from each other but each resulted in significantly fewer budworms than the untreated check. After the second application, parathion and the parathion-toxaphene combination resulted in significantly fewer budworms than toxaphene or phosphamidon. For each of the four remaining observation dates, parathion and combinations of parathion gave significantly better budworm control than DDT, toxaphene, phosphamidon, and phosphamidon combined with toxaphene or DDT. The heptachlor-parathion combination was superior to heptachlor following each of the last 3 sprays. Following the fifth spray, the heptachlor-parathion combination was significantly better than parathion. This was the only instance in which a parathion combination gave significantly better budworm control than parathion alone.

When the examinations following each of the 6 sprays were averaged, there were no significant differences among the treatments that contained parathion (Figure 2). Parathion, alone or in combination, gave significantly better control than all other treatments except the heptachlor-phosphamidon combination. Only the toxaphene-parathion and the heptachlor-parathion combinations were significantly better than the heptachlor-phosphamidon combination.

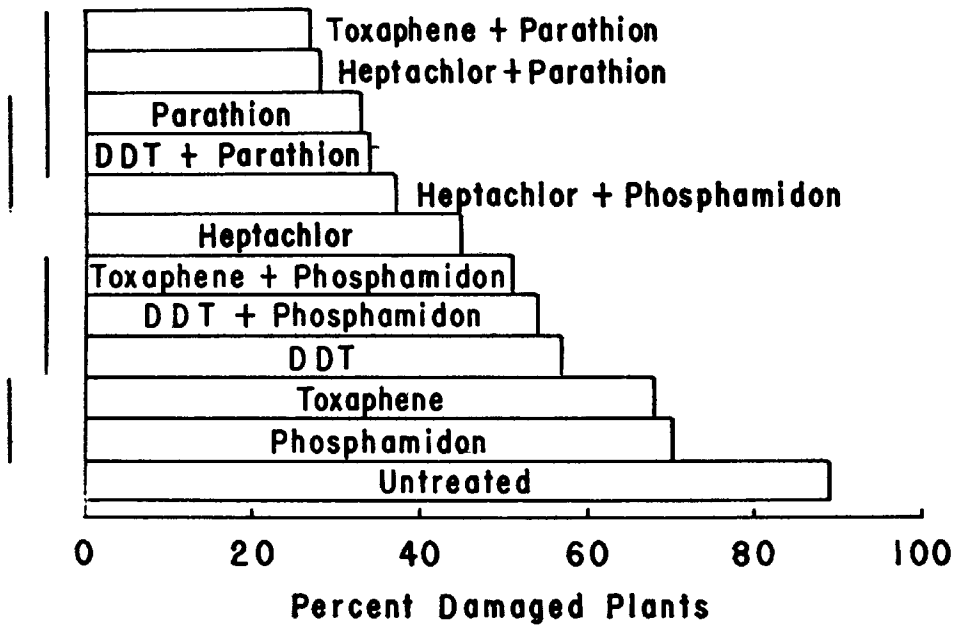

Fig. 2. Control of budworms on sweet corn with phosphates, chlorinated hydrocarbons, and combinations of phosphates and chlorinated hydrocarbons. Averages of 6 dates. Treatments that are bordered by the same vertical line are not significantly different; others are significantly different.

This experiment strongly indicated that toxaphene and DDT would not efficiently control budworms at the rates recommended at that time when applied on a weekly schedule. Parathion compared excellently with the other insecticides. Its short residual effectiveness is probably of little importance in the corn whorl where untreated leaf surface is soon exposed because of rapid growth.

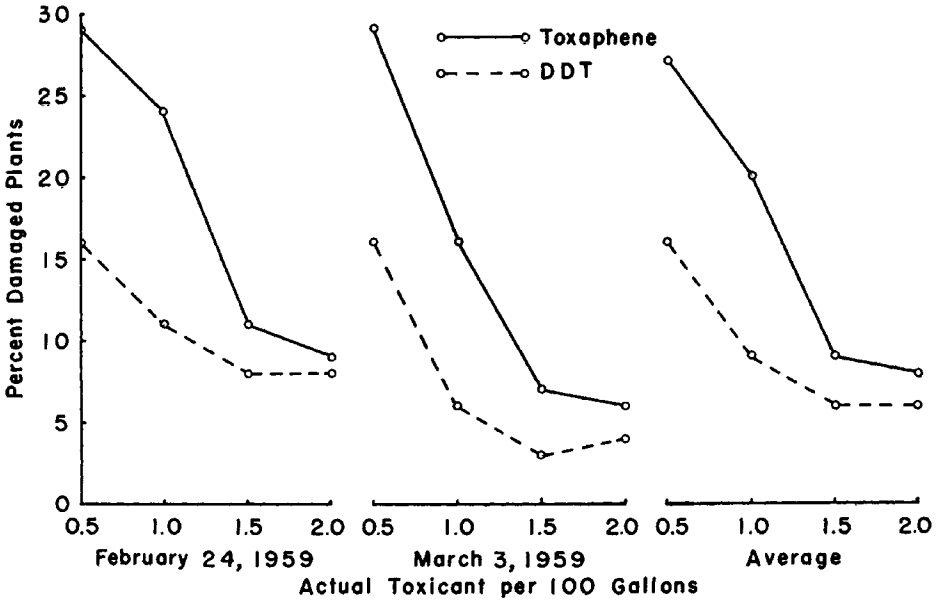

Fig. 3. Control of budworms on sweet corn with 4 dosages of toxaphene and DDT.

Toxaphene and DDT Rates

The preceding experiment indicated that toxaphene and DDT were inefficient for the control of budworms at the recommended dosages. This experiment was designed to determine the approximate dosage at which each chemical would control budworms on sweet corn. Each material was applied at a dosage of 0.5, 1.0, 1.5, and 2.0 pounds of actual toxicant per 100 gallons of emulsion to corn that was planted on January 26, 1959. The toxaphene and DDT emulsifiable concentrates contained 6 and 2 pounds of actual toxicant per gallon, respectively. Each treatment was replicated 8 times in a randomized complete block design.

Four sprays were applied at weekly intervals beginning February 4, 1959, using Spraying Systems Teejet D2-25 nozzles at 250 psi. The sprayer was driven at approximately 2.4 mph.

Two overhead nozzles per row were used in the first 3 applications. In the fourth application, one nozzle was added to each side of the row.

Of 61 caterpillars collected from untreated buffer rows March 3, 1959, 59 were fall armyworms and one was a corn earworm, *Heliothis zea* (Boddie). The remaining larva was a southern armyworm, *Prodenia eridania* (Cram.).

Examinations were made February 24 and March 3, six days after the third and fourth spray applications, by counting the number of budworm damaged plants among 25 plants in each row of the 2-row plots. The results are summarized in Figure 3.

On February 24, when 25 percent of the plants in untreated check plots were infested, the 2 lower rates of toxaphene gave significantly poorer budworm control than the other treatments. On March 3 and when the 2 examinations were averaged, the lower rate of DDT and the 2 lower

rates of toxaphene gave significantly poorer results than other rates of either material. Thirty-three percent of the plants in untreated check plots were damaged March 3. For each material there was a significant linear regression of percent budworm damaged plants on dosage. The shapes of the curves indicate that a dosage of either insecticide exceeding 1.5 pounds per 100 gallons would probably be unprofitable.

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A SMALL SELF-PROPELLED SPRAYER FOR AGRICULTURAL RESEARCH [1]

DALTON S. HARRISON, WILLIAM G. GENUNG AND EMMETT D. HARRIS, JR.[2]

The precision, accuracy, and number of experiments conducted for chemical control of insects or diseases of agricultural crops depend largely upon the type of application equipment available. The equipment used for pest and disease control by commercial growers is too large and cumbersome for use in the small field plots required in replicated insect or disease control experiments. Such equipment lacks the maneuverability to negotiate sharp turns in passing from one test plot to another in a replicated trial and the spray tank is so large that the use of small quantities of material is inaccurate. Hand equipment, such as the flit gun, knapsack sprayer, or compressed air sprayer, is grossly unreliable in attempting to apply a constant gallonage among several experimental treatments. It fails to duplicate or approximate the performance of equipment used by the commercial grower, and requires a tremendous expenditure in time and labor. The time and labor involved in using hand equipment is especially important in an area like the Everglades where it may be necessary to apply insecticides as often as every 48 hours for the control of insect pests on some vegetable crops.

The economic entomologist needs an insecticide sprayer that is a compromise between the large cumbersome sprayers used commercially and the hand equipment used by the home gardener.

The need for highly mobile self-propelled small plot sprayers has been recognized for years by research workers. The garden tractor has been used extensively by vegtable growers with small acreages and frequently has been used by the research worker with desirable results. Disadvantages are that the operator must walk along behind the machine, considerable physical effort is required to make the sharp turns required to pass from one randomized small field plot to another, and it is inappropriate for use on tall growing crops such as corn. Chada (1956) developed a small plot sprayer with detachable spray tank so that several tanks could be used to facilitate changing from one spray mixture to another. The machine was not self-propelled and was not suitable for use on tall growing crops. Douglas, *et al.* (1957) reported on a machine described as "simulating commercial spraying in small experimental plots." The most striking disadvantage of that sprayer was the necessity for the sprayer to be hauled on a truck while the boom is carried on foot, requiring three men, one each to carry the boom, to operate the spray pump, and to drive the truck. Large alleyways between plots were required for the truck to travel along. Another disadvantage is that the tank was too large (50 gallons) for accuracy in using small quantities of spray material and was not removable so materials could be changed without draining the tank.

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TABLE 1. MATERIAL AND LABOR COSTS OF SPRAY RIG. BELLE GLADE, FLORIDA, 1957.

1—John Bean Royalette 7 GPM Pump		$ 200.00
2—AC Front Wheels w/tires & tubes		72.50
2—AC Rear Wheels w/tires & tubes		72.50
1—Studebaker Champion Rear End (complete)		50.00
1—Drive Shaft		8.00
2—Universal Joints		6.00
2—Rebuilt Transmissions (Studebaker)		110.00
1—Steering gear assembly		15.00
1—Gear Shift Selector Box		3.00
2—Master Cylinders		16.00
2—No. 50B12 Browning Sprockets		4.40
2—No. 449-A-60 Diamond Sprockets		12.96
1—Clutch Assembly		48.64
2—NP16 Bearings		15.00
2—10 Gal. S.S. Tanks		29.90
1—Seat		39.00
Steel & Miscellaneous parts		21.19
1—Wisconsin Motor Model AEN, 8.2 h.p.		141.00
	Total Parts	$ 865.09
	Labor	250.00
	Total	$1,115.09

TABLE 2. TRAVEL SPECIFICATIONS OF THE SPRAY RIG.

Gear of No. 1 Transmission	Gear of No. 2 Transmission	Feet Per Min.	Miles Per Hour
1	1	154	1.75
1	2	200	2.38
1	3	400	4.55
2	1	200	2.38
2	2	400	4.55
2	3	665	7.55
3	1	400	4.55
3	2	665	7.55
3	3	1090	12.40

RPM Engine = 2800.

During the spring of 1954 an experimental sprayer for applying fungicides to small field plots was designed and constructed at the Everglades Experiment Station (Cox *et al.*, 1955). After this machine had been in use about 3 years, enough data had been collected on needed modifications to construct a small plot sprayer for use in entomological research.

It was felt that a small plot sprayer for use in insect control experiments at the Everglades Experiment Station should possess the following characteristics: (1) on a smaller scale, it should duplicate the type sprayer used in commercial vegetable production, capable of spraying pressures up to 400 psi; (2) it should possess a short turning radius so as to travel from one small plot to another using an alleyway 20 ft. wide or less; (3) it should be easy to change from one material to another without having to drain a large quantity of material from a spray tank; (4) it should be possible to determine accurately the quantity of material used; (5) it should be adaptable for use on tall crops as well as low growing ones; (6) it should be possible to reproduce accurately the gallonage applied from one material to another; (7) it should be durable without frequent need for repair or adjustment; (8) it should be self-propelled and (9) it could be operated by one man.

Materials and Methods

During the summer of 1957 a small field sprayer was designed and constructed at the Everglades Experiment Station. The sprayer is a 1-row type with an outrigger boom for spraying 2 rows of tall crops such as sweet corn (Fig. 1). The overall length of the machine is 7.5 feet while the overall width is 4.0 feet. Wheel tread width is 36 inches and the vertical ground clearance is 30 inches.

The frame of the sprayer is made from 2-inch, square steel tubing except for the rear wheel standards which are made from 3-inch, square steel tubing. The front end is made from a No. 518978 Allis-Chalmers front-end-assembly of a tractor. Front tires are 4.00-15 (implement) and the rear tires are 4.00-15 ground grip. All rims are split and extended two inches to provide greater flotation. The rear wheel assembly is a No. 518979 Allis-Chalmers. The front end steering assembly is an auto type, complete with selector box and steering wheel (Fig. 2).

The machine is powered by a Wisconsin air-cooled engine Model AEN (8.2 h.p.). The PTO of the engine is attached directly to an automotive clutch by a flexible coupling (Fig. 3). The drive to the rear end is through two Studebaker transmissions, connected in tandem, through U-joints (Fig. 4). This arrangement permits speed of 1.75, 2.38, 4.55, 7.55, and 12.40 m.p.h. at full throttle (Table 2). The governor is adjusted so that full throttle is at 2800 rpm engine speed.

A separate master cylinder is installed with each brake pedal to provide individual tractor type braking for each rear wheel. Two Number 449-A-60 Diamond Sprockets (Fig. 5) mounted on the rear wheels are chain driven by number 50B12 Browning sprockets mounted on rear wheel drums of the rear end assembly.

A jack shaft is mounted immediately in front of the main clutch furnishing a V-belt drive to the pump (Fig. 3). The pump is a John Bean Royalette 7 GPM. A separate clutch is installed so that the nozzles may be

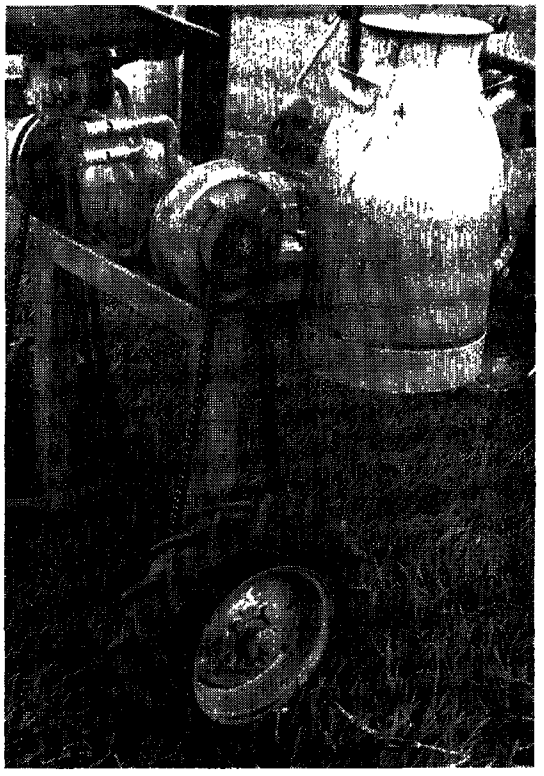


Fig. 1. Rear end assembly showing chain drive to wheels.

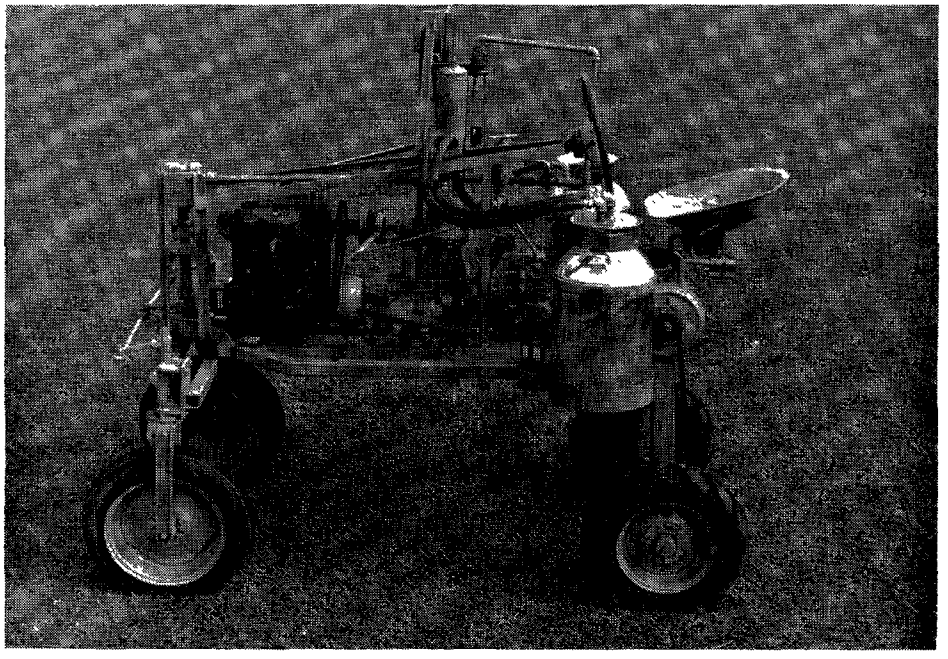
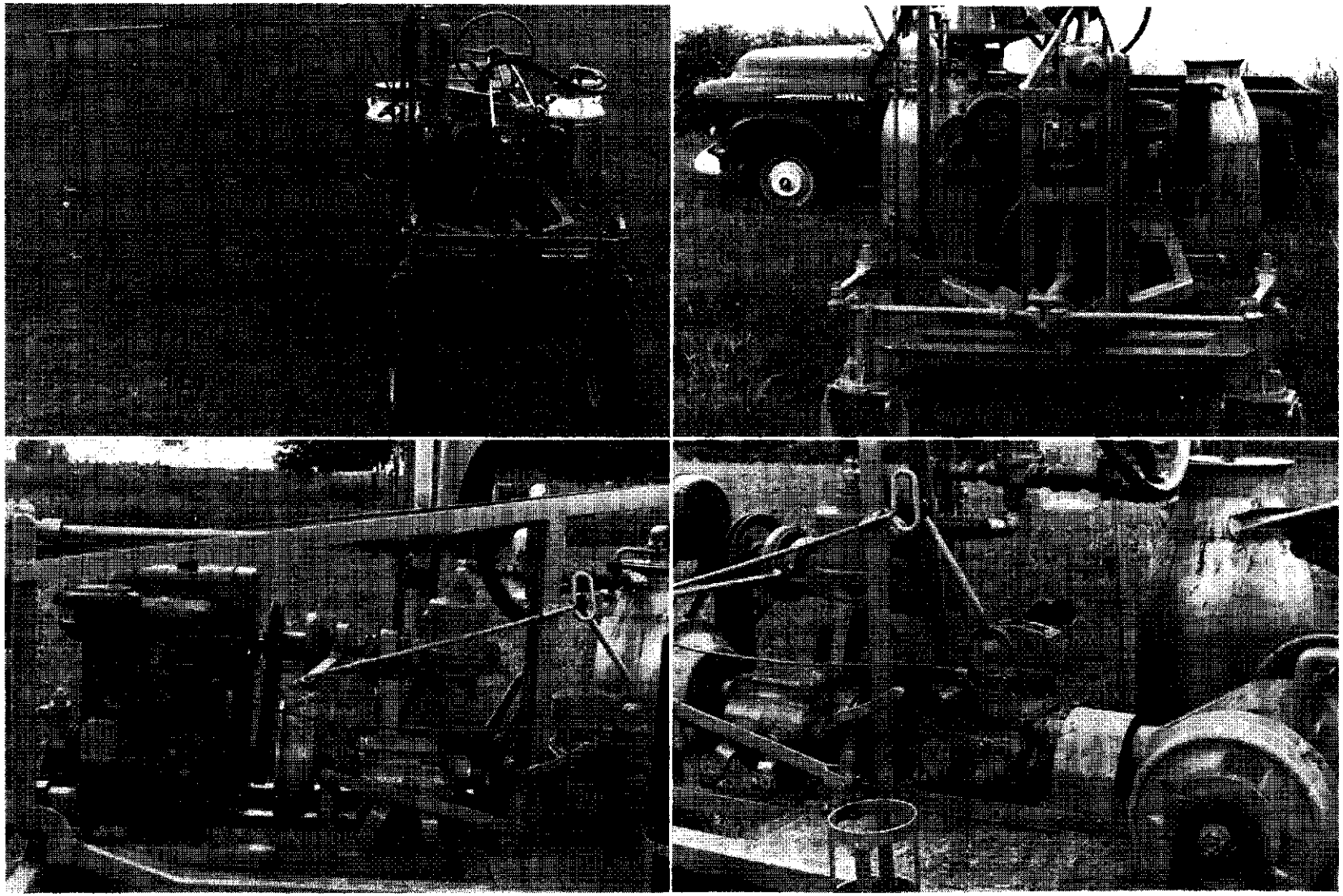


Fig. 2. Side view of sprayer.



Upper left: Front view of sprayer showing outrigger boom for spraying two rows of sweet corn.
Upper right: Front end of sprayer showing steering mechanism.
Lower left: Side view showing engine mounting and transmission assembly.
Lower right: Transmission assembly and power transmission to rear end.

calibrated while the machine is stationary. An outrigger boom mounted on the right side of the machine is adjustable from 30″ to 60″ in height (Fig. 1). This boom has three drops capable of spraying two rows of corn with one trip. When the outrigger boom is not needed, it may be removed and a vegetable boom mounted underneath the frame of the sprayer.

One stainless steel tank (10 gal. capacity milk cans) is mounted on each side of the machine for spray materials. In addition, a washer tank for cleaning the line is mounted on the left side near the spray tank. Jet agitation is used to keep the materials in suspension.

Conclusions

The self-propelled small plot sprayer designed by the authors has been utilized for two seasons in insect control studies (Harrison and Harris, 1958). By using the proper procedure 1 man can treat a given number of plots in much less time than with 4 men using hand equipment. Although only 1 man is necessary to perform the spray operation, an extra man is desired for handling the cans and mixing materials.

This machine is small and maneuverable for use on small plots and it can apply the insecticide sprays in a manner comparable to a large commercial sprayer. To change from one spray formulation to another, one merely has to exchange 10-gallon milk cans, flush the pump and boom with clean water and the new material. Insecticide materials are formulated before going to the field and several cans of water are taken to the field to ease and speed the spraying operation. The amount of material applied is determined by measuring the amount of liquid in the spray tank before and after spraying. The output per nozzle in gallons or milliliters per minute is used to determine the speed at which the sprayer should travel to apply a given gallonage at a given pressure. Usually, the gallonage applied varies within 1 or 2 percent of that planned.

In summary, this machine has satisfied all the requirements that the authors desired of a small plot sprayer for use in insect control research.

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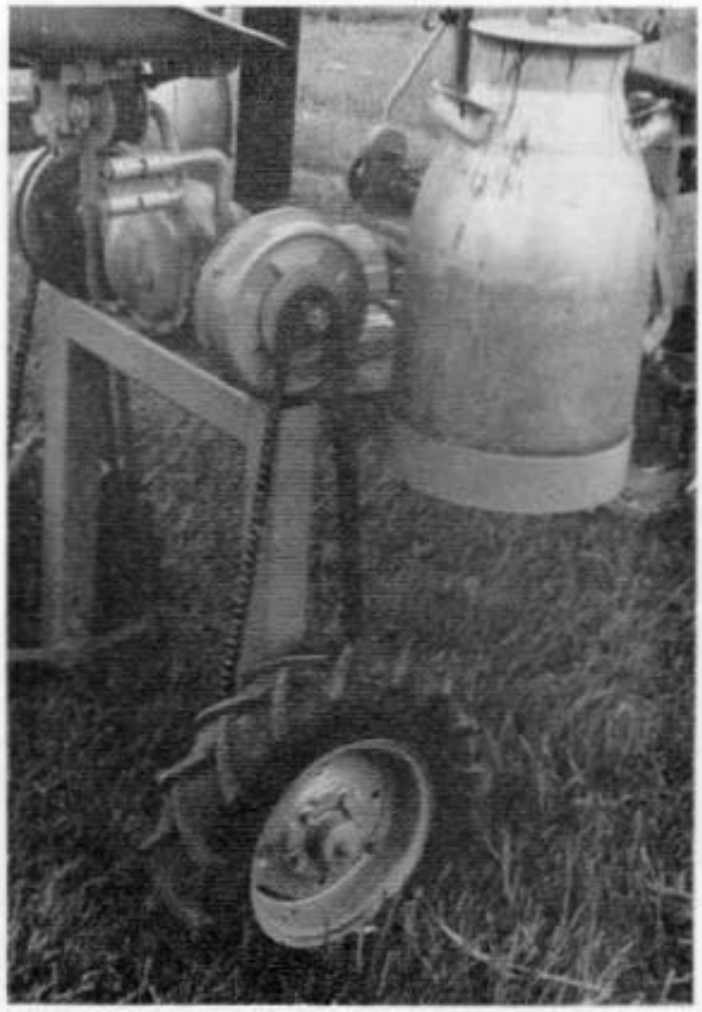
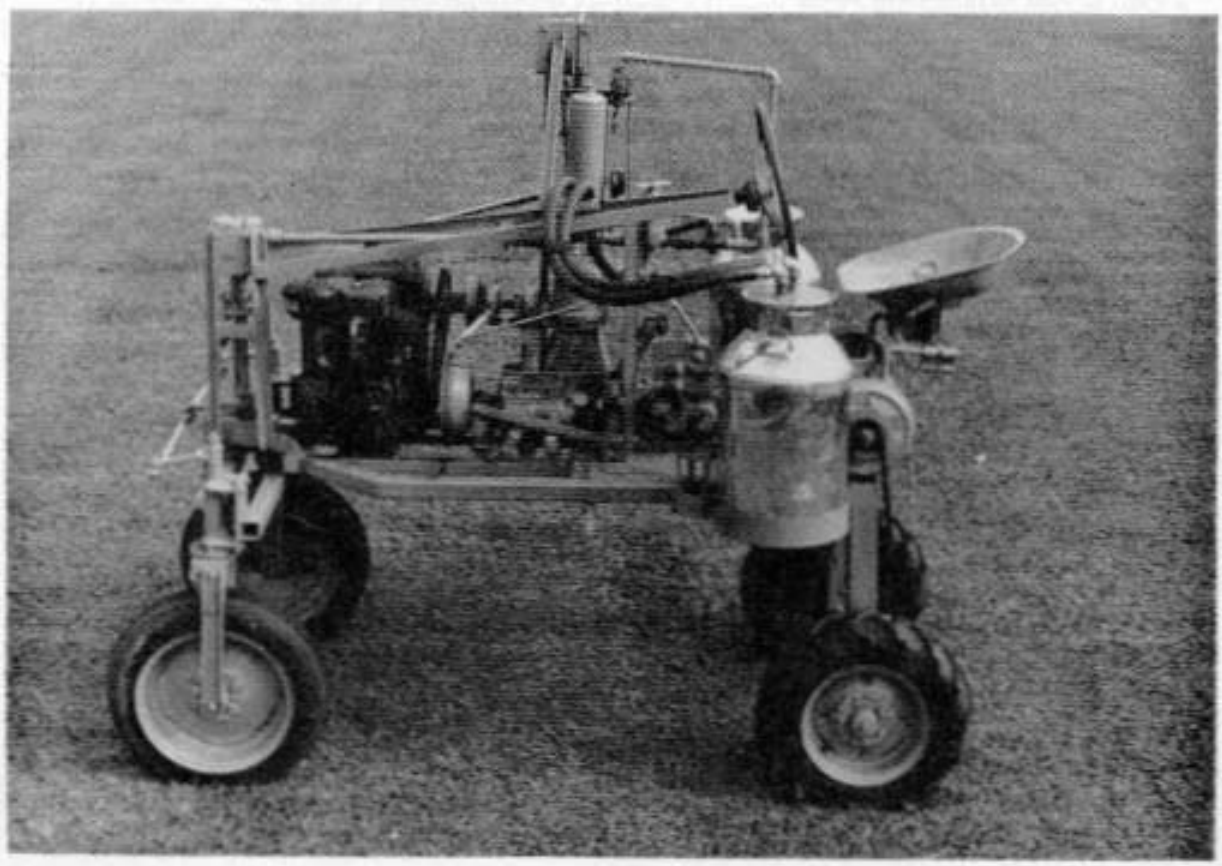
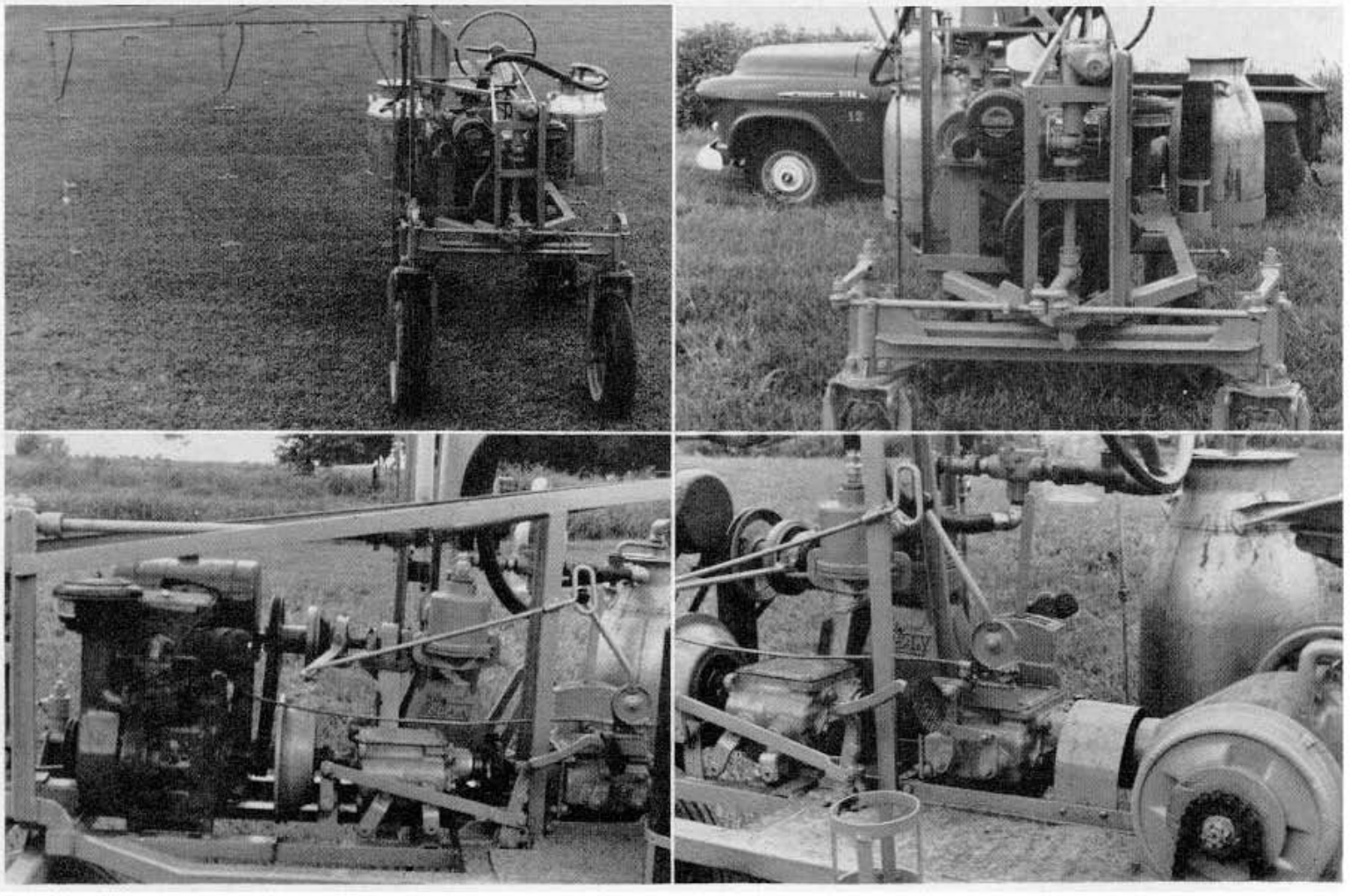






LABORATORY TESTS WITH SIXTY-FIVE COMPOUNDS AS REPELLENTS AGAINST HOUSE FLIES

G. C. LaBrecque and H. G. Wilson [1]

The rapid development of resistance to insecticides in house flies (*Musca domestica* L.) indicates a growing need for other approaches toward their suppression. Food-handling establishments and military installations could well benefit from a repellent. A residual treatment to the approaches to buildings, as well as to areas where refuse is kept would prevent flies from congregating in these locations, and thereby reduce the sources from which they normally migrate into the buildings. Areas around poultry houses and dairy barns could also be sprayed with a repellent until proper disposal of breeding materials could be arranged. In these circumstances a good repellent would not obviate the need for insecticides, but would reduce the frequency of applications and thus retard the development of resistance.

At Orlando, Fla., 65 chemicals were tested in the laboratory as vapor or contact repellents against house flies. Some of the compounds were received from commercial laboratories where they had been developed specifically as fly repellents, and others were selected because of their repellency to other species.

A semicircle of heavy white cardboard 3¼ inches in radius was sprayed with a 2 percent solution of the repellent in acetone to give a deposit of 200 milligrams per square foot. Twenty-four hours later the card was rolled into the shape of a funnel, stapled, and placed in the top of a standard drinking glass to form an inverted cone trap. The treated side of the card formed the interior of the funnel. Prior to its insertion 10 grams of Edamin (a casein hydrolysate) moistened with 10 milliliters of water was placed in the bottom of the trap as an attractant, and a screen barrier was placed above the solution to prevent contact of flies with the attractant. A duplicate trap containing an untreated funnel was utilized as the standard.

The traps were exposed for 30 minutes at opposite ends of a cage, 7 x 10 x 10 inches, containing 100 flies of mixed sexes. The number of females in the untreated trap divided by the number in the repellent trap gave the repellency ratio. Only female flies were counted, as Edamin is much more attractive to females than males. If less than five were captured in the untreated trap, the test was discarded. Duplicate tests were run with each repellent, with 2 sets of funnels and 2 cages of flies. The treated funnels were then stored for aging. Tests were run at 1 and 2 days of aging, after which, if the ratio of repellency remained greater than 2.0, they were tested after 7, 14, 30, 60 and 90 days, until the ratio dropped below 2.0.

The results with 28 compounds that were effective for 2 or more days are given in Table 1. The most promising compounds were di-*n*-octylamine, *n*-propyl *n*-octyl sulfoxide, and 3-chloropropyl *n*-octyl sulfoxide, which were effective more than 90 days. Allyl *n*-octyl sulfoxide and *N*-amyl-2,3-norcamphanedicarboximide were effective for 30 days and *N*-(*n*-pentyl)succinamide, *N*-*n*-heptylphthalimide, and *N*-*sec*-pentylphthalimide for 14 days.

[1] Entomology Research Division, Agricultural Research Service, U.S.D.A.

TABLE 1. EFFECTIVENESS OF 28 COMPOUNDS AS HOUSE FLY REPELLENTS IN GLASS-TRAP TESTS. (AVERAGE OF 2 REPLICATIONS.)

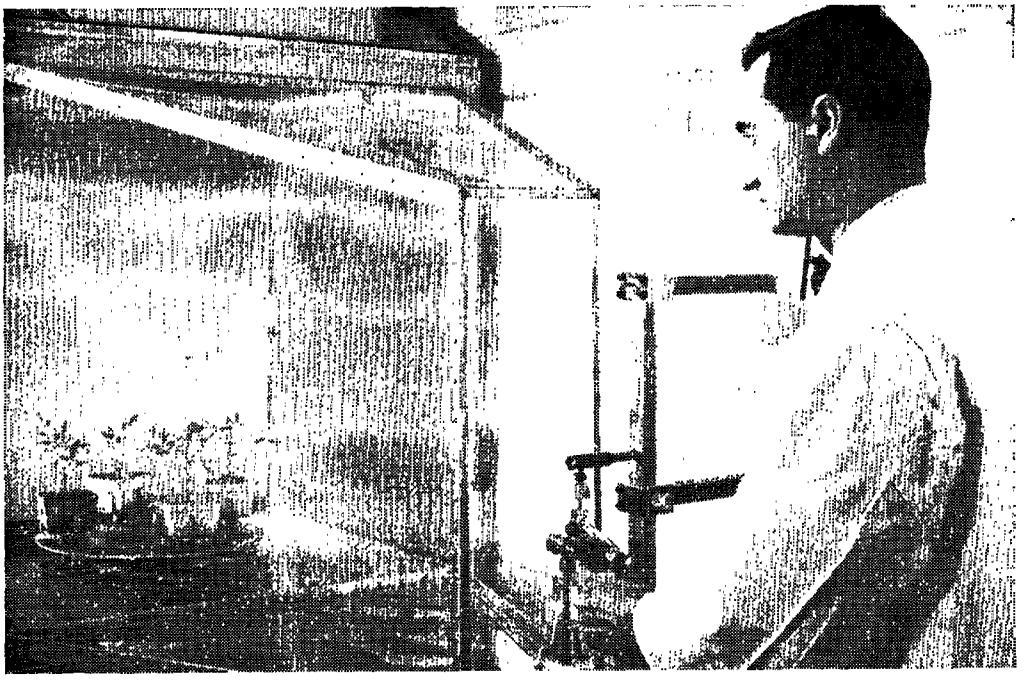
Repellent	Repellency ratio at indicated days of aging						
	1	2	7	14	30	60	90
Di-*n*-octylamine	15.3	16.0	2.9	12.0	9.3	6.1	8.7
n-Propyl *n*-octyl sulfoxide	21.0	9.3	11.0	3.4	5.8	3.3	3.0
3-Chloropropyl *n*-octyl sulfoxide	4.6	6.5	2.4	3.6	2.9	9.3	4.7
Allyl *n*-octyl sulfoxide	3.4	7.7	8.7	4.6	2.4	1.4	—
N-Amyl-2,3-norcamphanedicarboximide	2.5	2.4	4.9	4.0	3.0	1.2	—
N-(*n*-Pentyl) succinimide	8.7	10.7	2.9	2.4	<1.0	—	—
N-*n*-Heptylphthalimide	1.2	3.3	2.7	3.2	1.8	—	—
N-*sec*-Pentylphthalimide	2.9	4.1	2.0	2.4	<1.0	—	—
2-[*p*-2-(2-Methylbutyl) aniline]ethanol	1.2	4.3	2.5	1.9	—	—	—
2-[*p*-2-(2-Methylbutyl) phenoxy]ethanol	3.0	3.5	3.0	1.8	—	—	—
N-Ethylphthalimide	3.6	3.3	4.0	1.1	—	—	—
N-Isopentyl-*n*-butyranilide	2.8	2.3	2.0	1.4	—	—	—
tert-Butylsulfinyl dimethyl dithiocarbamate	1.9	3.2	2.5	2.0	—	—	—
N,*N*-Di-*n*-butyl methyl sulfinamide	7.8	8.3	6.2	1.2	—	—	—
Isobutoxyethyl *n*-octyl sulfoxide	2.8	2.5	2.4	<1.0	—	—	—
N-Pentyl-1,2-cyclohexanedicarboximide	2.1	4.0	<1.0	—	—	—	—
N-Pentylphthalimide	4.4	2.3	1.7	—	—	—	—
N-Butylphthalimide	1.1	3.3	1.0	—	—	—	—
Fencholic acid	10.0	3.1	1.0	—	—	—	—
N-Isobutylphthalimide	2.2	2.6	1.5	—	—	—	—
N-Isopropylphthalimide	3.3	4.8	1.4	—	—	—	—
Malonic acid	2.4	3.0	1.3	—	—	—	—
2-Hydroxypropyl *n*-octyl sulfide	3.1	3.8	1.7	—	—	—	—
tert-Dodecyl 2-hydroxyethoxyethoxyethyl sulfoxide	2.4	3.8	1.4	—	—	—	—
2-(1-Aminocyclohexyl) cyclohexanone	<1.0	2.8	1.0	—	—	—	—
Methallyl *n*-octyl sulfoxide	5.3	4.2	1.2	—	—	—	—
N-Propylphthalimide	3.0	3.3	<1.0	—	—	—	—
Pyrethrum extract + piperonyl butoxide (1:10)	7.7	10.5	1.0	—	—	—	—

The following materials were not effective for more than 1 day:

Acetate of 2-methyl-1-phenylethanol
Acetate of 1-nonanol
Acetone
4,4′-Adipylmorpholine
Ammonium *para*-methyldithiocarbanilate
Benzhydryl thiocyanate
N-Benzylphthalimide
alpha-[2-(2-butoxyethoxy)ethoxy]-4,5-methylenedioxy-2-propyltoluene (piperonyl butoxide)
2-(2-Butoxyethoxy)ethyl chloroacetate
n-Butoxyethyl *n*-octyl sulfoxide
alpha-Butoxy-*N*-pentylacetamide
Butoxypolypropylene glycol
N-sec-Butylphthalimide
Diacetate of 4-octene-4,5-diol
Dibutyl diglycolate
n-Dibutyl succinate
Diethyl *gamma*-acetyl-*gamma*-iso-propenylpimelate
Ephedrine
Ethyl acetyloximinoacetoacetate
Ethyl hippurate
Ethyl nipecotate
Ethyl salicylate
x-Heptadecyl-1,3-dimethyl-1,3-diphenylcyclobutane
2-Hydroxyethyl *n*-octyl sulfide
2-Hydroxyethyl *n*-octyl sulfoxide
Isoeugenol
N-Isopentylacetanilide
Isopentyl *p*-aminobenzoate
Isopentyl salicylate
Isophorone
N-Methylphthalimide
N-(*n*-Octyl)phthalimide
n-Octylsulfinylpropyl propionate
Oil of sweet marjoram
2,4,4,4′,7-Pentamethyl-2′-flavanol
Phenothiazine
Pyrethrum extract (20% pyrethrins)

Summary

Glass-trap tests were made with 65 chemicals to determine their effectiveness as vapor or contact repellents against house flies (*Musca domestica* L.). The most promising compounds were di-*n*-octylamine, *n*-propyl *n*-octyl sulfoxide, and 3-chloropropyl *n*-octyl sulfoxide, which were effective for more than 90 days.



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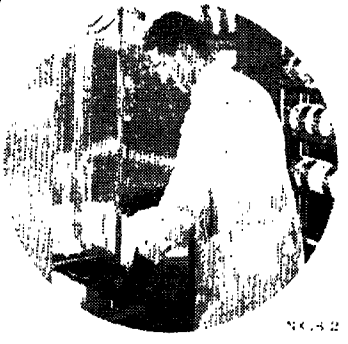
Today in the laboratories, research continues on the products that will join them in the future. But before they become available you can be sure that thousands of compounds have been carefully screened and extensive tests conducted in the field because only the best is good enough to meet the standards of Hercules research. That's why you can look to Hercules for leadership in the development of insecticides, fungicides, and herbicides.



Agricultural Chemicals Division, Naval Stores Department

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MINUTES OF THE FORTY-SECOND ANNUAL MEETING OF THE FLORIDA ENTOMOLOGICAL SOCIETY

The meeting convened at the McAllister Hotel, Miami, Florida on the morning of September 10, 1959, with President William P. Hunter presiding. The two-day program was composed of the Presidential Address, 5 invitational papers, and 32 submitted papers. One invitational paper, not on the printed program, was an illustrated talk on Russian agriculture and entomology by Dr. Theodore Dobrovsky, Food and Agricultural Organization, Rome, Italy. Dr. Dobrovsky is a former member of the Staff of Florida Agricultural Experiment Station and member of the Society.

On Wednesday evening, September 9, The Subtropical Branch of the Florida Entomological Society held a regularly scheduled meeting in the McAllister Hotel. This meeting was attended by many members of the parent Society.

The first business session was held at noon on September 10. President Hunter appointed Audit and Resolutions Committees. Since the minutes of the 41st Annual Meeting had been published in the FLORIDA ENTOMOLOGIST Volume 41, No. 4 (December 1958), it was moved, seconded and voted that the minutes stand approved as printed. No other business was presented and the session adjourned at 12:10 p.m.

The second business session was convened at 4:25 p.m., September 10, with President Hunter presiding. Dr. Robert E. Waites presented the Report of the Treasurer-Business Manager which was followed by the Report of the Audit Committee.

REPORT OF TREASURER-BUSINESS MANAGER FOR YEAR ENDING

AUGUST 31, 1959

Receipts

Dues	$ 193.00
Subscriptions	405.00
Reprints and Plates	310.50
Advertising	1115.43
	$2023.93
Cash on hand 9/12/58	2183.17
	$4207.10

Disbursements

Bastain Bros. for convention badges	$ 7.13
Postmaster, Gainesville, postage and box rent	36.40
Nelson The Florist, for banquet flowers	36.05
Frisco Printing Co., for banquet tickets	4.12
Young Pest Control Lab. for long-playing tapes	11.33
Pepper Printing Co.	2479.12
Parker Office Supply	12.52
Lewis Berner for postage and expenses	10.00
L. A. Hetrick, postage and lettering honorary certificates	21.00
Bank service charge	2.10
	$2619.77
Cash on hand 8/31/59	1587.33
	$4207.10

Respectfully submitted,

R. E. Waites
Treasurer-Business Manager

Report of Audit Committee

The Treasurer's Report and the books of the Society have been examined for the year ending August 31, 1959, by the Auditing Committee and found to be in order. We recommend to the Society that the above-printed report be accepted.

We would also like to compliment the Treasurer-Business Manager for the neat and orderly manner in which we found the account books.

Respectfully submitted,
G. W. Dekle
Martin H. Muma, Chairman

It was moved, seconded, and voted that the Report of the Treasurer-Business Manager and the Report of the Audit Committee be accepted.

President Hunter called the attention of the members present to the new State Board of Health restrictions on the use of highly toxic pesticides in residential areas.

Additional Reports presented at this time were as follows.

Report of Committee on History of the Society

Information is being collected from the Florida Entomologist and from the files of the Secretary, reports of meetings, records of proceedings, and other documents of historical value. Members who may have recollections of early happenings in the Society or who know of other unpublished data are requested to send such material to any member of this committee. From the assembled material the committee will prepare an article of suitable scope and form to be included in Dr. E. C. Nance's three volume history of Florida. A copy of the article, or a modification of it, likewise will be submitted for publication to the Editor of the Florida Entomologist.

L. A. Hetrick
Andrew J. Rogers
A. N. Tissot, Chairman

Report of Committee on Necrology

The committee reports with sorrow the passing of James Zetek, member of the Florida Entomological Society from 1912 until his death, and of C. B. Wisecup who was a member from 1936 until 1946 when he was transferred to another state. Though stationed far from Florida, on Barro Colorado Island in the Canal Zone, Mr. Zetek was intensely interested in the Florida Entomological Society and he was one of its most loyal and faithful members. While living in Florida, Mr. Wisecup was an active and enthusiastic member of the Society and he served it well as Treasurer-Business Manager during the last three years of his residence in the State. The committee will secure or prepare obituaries on these gentlemen for publication in the Florida Entomologist so that their memories may remain as an inspiration to future generations of members.

Herbert Spencer
W. B. Tappan
A. N. Tissot, Chairman

There was no further business and the session adjourned at 4:50 p.m.

An enjoyable social hour preceded the annual banquet on the evening of September 10. Dr. E. G. Kelsheimer served as toastmaster and made introductions. There were no speeches. Music was provided by a local string trio and an electronic organ.

The final business session was convened by President Hunter on September 11 at 3:10 p.m. President Hunter thanked the officers, members of

the Local Arrangement Committee, members of the Program Committee, and many others who contributed to the success of the meeting.

President Hunter informed the members that Certificates of Honorary Membership had been delivered to K. E. Bragdon, A. C. Brown, W. V. King, G. B. Merrill, and W. W. Yothers. Although these men had been elected to Honorary status at previous Society meetings, Certificates of Honorary Membership had not been delivered to them until this year. Dr. W. V. King was the only Honorary Member who attended the 42nd Annual Meeting. Dr. King was accorded public recognition during the meeting.

Calls were made for old business and new business. Since there were no items to be considered at this time, The Report of the Resolutions Committee was requested.

Report of Resolutions Committee

1. Whereas the invitational speakers contributed significantly to the success of the 42nd Annual Meeting of the Florida Entomological Society, be it resolved that the Society express its appreciation to these speakers.
2. Whereas the Editor of the FLORIDA ENTOMOLOGIST has through untiring effort maintained a high standard of the Society's publication, be it resolved the Society extend to Dr. Lewis Berner a vote of thanks and confidence for his excellent editorship.
3. Whereas death has taken from our midst James Zetek and C. B. Wisecup, loyal and faithful members of the Florida Entomological Society, and Whereas the Society has suffered a great loss in their passing, *Therefore be it resolved:* That the members of the Society publicly acclaim the many contributions that Mr. Zetek and Mr. Wisecup have made in the field of entomology and that we sorrowfully acknowledge our loss in their deaths, and *Be it further resolved:* That the Secretary be instructed to write letters of condolence to the families of the deceased and express to them our heart-felt sympathy.
4. *Be it further resolved:*
   A. That the Society express its special appreciation to the Local Arrangements Committee and Program Committee for arranging and conducting this excellent meeting;
   B. That the Society does hereby express its sincere thanks to the members of industry for a most enjoyable social hour;
   C. That the Society does hereby express its sincere thanks to the management and staff of the McAllister Hotel for their part in the success of the 42nd Annual Meeting.

I. H. Gilbert
Norman C. Hayslip
Milledge Murphey, Chairman

President Hunter asked for the Report of the Nominating Committee.

Report of Nominating Committee

President	Andrew J. Rogers
Vice President	Lewis Berner
Treasurer-Business Manager	R. E. Waites (continuing)
Secretary	L. A. Hetrick
Executive Committee	G. G. Rohwer
Executive Committee	John E. Porter (continuing)
Editor	Lewis Berner (continuing)
Associate Editor	Norman C. Hayslip (continuing)

Respectfully submitted,

A. A. Whipp
H. A. Denmark
J. W. Wilson, Chairman

There were no additional nominations from the floor. It was moved, seconded, and voted that the Secretary be instructed to cast a ballot to elect the slate of officers presented by the Nominating Committee.

The newly elected President, Dr. Andrew J. Rogers, was escorted to the platform and President Hunter conveyed the Society's gavel to him. Dr. Rogers thanked the members of the Society for the confidence and trust placed in him.

James Heidt expressed the pleasure of the members of the Subtropical Branch for having the meeting in Miami.

Currently, the Society has 289 members. During the year 36 members were dropped from the Society and the following 37 new members became affiliated.

W. C. Adlerz
W. L. Bidlingmayer
A. A. Chadwick
D. W. Clancy
F. P. Clements
W. R. Comegys
H. S. Creamer
E. E. Crooks
E. H. Doty
R. F. DuChanois
H. M. Faircloth
A. R. Gary, Jr.
J. T. Hayward
I. W. Hughes
R. H. Jackson
D. B. Lieux
R. G. Manee
H. R. Mangus
V. F. McCowan
R. A. Newkirk
J. W. Patton
G. G. Rohwer
T. W. Sistrunk
G. W. Smith
G. F. Spencer
R. W. Swanson
T. R. Taylor
Lisa von Borowsky
D. L. von Windeguth
B. G. Watson
D. R. Wilson
W. P. Wilson
W. J. Woodman
R. E. Woodruff
R. B. Workman
T. Roy Young, Jr.
P. M. Zipperer

Sessions of the Executive Committee were held on the evening of September 9 and during the lunch hour on September 10.

President Rogers adjourned the meeting at 3:55 p.m. September 11, 1959.

L. A. Hetrick
Secretary

FLORIDA ENTOMOLOGICAL SOCIETY
LIST OF MEMBERS

† Honorary Members * Past Presidents

Adlerz, Warren C., P. O. Box 321, Leesburg, Florida
Alden, J. C., Woolfolk Chemical Co., Ltd., Fort Valley, Georgia
Alexander, Donald H., P. O. Box 34-971, Coral Gables, Florida
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Anthony, D. W., Animal Disease Station, Agric. Res. Center, Beltsville, Maryland
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Arnaud, Paul H., Jr., 1220 N. Street, Sacramento 14, California
Ascher, Larry, 404 N.W. 2nd Ave., Miami, Florida
Assonamon, S., 3432 S. Dale Mabry, Tampa 9, Florida
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Ayres, Ed L., 101 Cortez Road W., Bradenton, Florida

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*Byers, C. F., Flint Hall, Univ. of Florida, Gainesville, Florida

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ON THE DISCOVERY OF TWO ECONOMIC SPECIES OF ERIOPHYID MITES ON MANGO AND CITRUS TREES IN FLORIDA

HASSAN H. ATTIAH
Director, Acarology Investigations, Ministry of Agriculture,
Dokki, Egypt, U. A. R.

On August 25, 1959, during my visit to the Sub-tropical Experimental Station, University of Florida, Homestead, it was noticed that one mango tree of the grove did not seem to be attaining its normal size. The terminal buds were dark brown, the terminal leaves of some branches were defoliated, and some of the new leaves were deformed. Buds were examined under a dissecting microscope and the eriophyid mite, *Aceria mangiferae* Sayed, was found beneath the scales.

On August 26, 1959, the mite was also found in the buds of a tree of the U. S. Department of Agriculture Plant Introduction Garden at Miami. The tree was normal in size, but some of the terminal buds were dark brown and had lateral buds growing around them.

Aceria mangiferae was considered in Egypt to cause severe malformation in the vegetative and the floral growth. These symptoms have spread widely during the last few years and diseased, young trees failed to attain normal size and growth. Experiments were carried on to control the mite; Systox, 50 per cent at the rate of 75 cc/100 liters water at 15 or 21 day intervals during the period of vegetative and floral growth resulted in good control of the mite, but symptoms did not stop. It was suspected that the symptoms were due to a virus which might be transmitted by the mite. Experiments are now being carried on in Egypt in that connection.

On August 27, 1959, in a small garden at South Miami, deformations of the leaves, especially on the new twigs, of some orange trees were noticed. Buds were examined and the citrus bud mite, *Aceria sheldoni* (Ewing) was found inside. The trees were also infested by the rust mite *Phyllocoptruta oleivorus* (Ashmead).

Preparations of the two mites, *Aceria mangiferae* Sayed, and *Aceria sheldoni* (Ewing) were deposited at the U. S. National Museum.

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News Items

Dr. John T. Creighton announces the recent addition to the Graduate Faculty of the Department of Entomology, University of Florida, of Lewis Berner, Roland F. Hussey, and Minter J. Westfall, all members of C-6, Biological Sciences, staff.

The present composition of the Graduate Faculty of this Department is:

Blanton, Franklin S. (Ph.D., Cornell University)
Berner, Lewis (Ph.D., University of Florida)
Christie, Jesse Roy (Ph.D., George Washington University)
Creighton, John Thomas (Ph.D., Ohio State University)
Hetrick, Lawrence Andrew (Ph.D., Ohio State University)
Hussey, Roland F. (Sc.D., Harvard University)
Kuitert, Louis Cornelius (Ph.D., University of Kansas)
Muma, Martin Hammone (Ph.D., University of Maryland)
Murphey, Milledge (Ph.D., Oklahoma A. & M. College)
Perry, Vernon G. (Ph.D., University of Wisconsin)
Smith, William Ward (Ph.D., Tulane University)
Simanton, William Aldrich (Ph.D., Iowa State College)
Tissot, Archie Newton (Ph.D., Ohio State University)
Walker, Thomas J. (Ph.D., Ohio State University)
Westfall, Minter J., Jr. (Ph.D., Cornell University)
Wilson, John Wallace (Sc.D., Harvard University).

I wish to take this means to publicly express my personal appreciation to every member of the Society who contributed to the highly successful 42nd Annual Meeting in Miami. I particularly want to thank the other officers and the members of the committees who carried out their tasks so well.

William P. Hunter
Retiring President.

Mr. William P. Hunter has moved from the Gainesville Branch of Kilgore Seed Company and is now associated with their General Offices and Laboratory in Plant City, Florida.

The FLORIDA ENTOMOLOGIST

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CONTENTS

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PRESIDENTIAL ADDRESS [1]

MILLEDGE MURPHEY, JR.[2]

I do not know when the idea of the presidential address began, nor do I know any real reason for the president to address the membership of a society at the end of his term of office. This time-honored custom is apparently a necessary evil that we all have to bear. During the last few months I have pondered many times the words of Past President Butcher when he compared preparing the presidential address to the normal course of events associated with the birth of a baby, the momentary pleasure of conception (the honor of being elected president) which is shortly followed by the realization that the thing must be delivered within a few months. If you did not hear Dr. Butcher's address, I would certainly recommend your finding the December, 1955, issue of THE FLORIDA ENTOMOLOGIST and reading his wise and profound words. Certainly it is a must reading assignment if you are given the honor to direct the activities of our society for a year. And I assure you his well chosen words will bring much comfort during those wakeful hours of near hysteria that are sure to come during the development period.

The other day I mentioned to my family my quest for a subject for a presidential address and my older daughter, who is a teenager, asked, and about ways to cut the national budget, and he remarked that one good thing about a presidential address was that it could be one minute or one hour, and the president made the decision. I want to assure you that this address will be closer to the former than to the latter. And when a member of the program committee remarked just 30 days ago that so many papers had been received that he doubted if they would have time for a presidential address, I decided to cut my remarks in half.

Not long ago I was talking with an entomologist friend about taxes and about ways to cut the national budget, and he remarked that one agency he knew could certainly have its budget cut because half of the men working in it had no purpose. The thought of men or scientists having a purpose has returned to my mind many times since that conversation. Of course everyone has a purpose of some sort. Just being on hand from 8 to 5 waiting for the monthly pay check is a purpose, and this was probably the kind of purpose my friend was talking about. Such a purpose, with the long coffee break, with many bull sessions, and little completed work is catching and before long can seep throughout the best of organizations. It reduces the output of work and always breeds unhappiness and discontent. Usually the most discontented people are those that produce the least. A busy man is a happy man. And for an organization to develop and progress it must have a leader with a good purpose and with an enthusiasm that can be passed on to his fellow workers. The proper enthusiasm is catching and the young scientist is certainly fortunate who is assigned to work with a leader who has a drive and a purpose and not one who is resting on his laurels.

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[1] Presented at the Forty-second Annual Meeting, Florida Entomological Society, Miami, September 10-12, 1959.

[2] Entomology Department, University of Florida, Gainesville.

Just recently, Dr. J. Wayne Reitz, President of the University of Florida, wrote an article in which he estimated over two-thirds of the students entering the University had little or no idea what they wanted to take or what they wanted to do with their lives. I am sure Dr. Reitz was not taking into consideration the co-eds when he made his summary, because most co-eds know what they are trying to get from the University. This lack of decision on the part of the student can be translated into a lack of purpose. Many are going to college because it is the thing to do after finishing high school. During my 11 years of teaching I have counseled many students about courses, and it is discouraging to say that many take a college course for 3 hours credit and not to learn something about the subject. This same attitude is also found throughout the public high schools. "Take something easy so I can get my 20 credits to graduate." "Give me band and shop." Or, do as one high school senior I talked with this fall, was doing by taking 3 credits of mechanical drawing in which he already had one credit. No chemistry, physics, algebra, language; no, they are hard and he must graduate. You see, the purpose is to get 20 credits to graduate, not to get an education to prepare himself for college or a more purposeful and eventful life. It is certainly stimulating to an instructor to have several foreign students in his classes because these young men are here with a purpose and in addition to the credits, they want to know something about the subject. I do not want to give the impression that all students lack a purpose or that at a university all students are in this category. If you think back over your college courses, the good ones were those in which the professor had a definite purpose, and with that purpose he had enthusiasm in the subject that was catching to the student. The field of study of a good course was not nearly as important as the interest and attitude of the professor. He made the subject interesting, and you learned something. But the professor who read old notes in a sing-song manner, gave few tests, and turned his papers for grading and his laboratories over to the student assistant, lacked enthusiasm in what he was doing, and his students responded accordingly. Such a professor is actually worse than the 8 to 5 clock watcher because he is working with young people who need stimulation, encouragement, and an increased desire to do a good job. With the majority of our college students undecided as to their careers, a professor could have no greater challenge than he has today in teaching his chosen field.

We have many enthusiastic entomologists. Probably the most enthusiastic group are the collectors. When I was working for the State of Georgia, I had the pleasure of knowing and working with Professor P. W. Fattig of Emory University. P. W. Fattig was a collector. He spent most of his professional life collecting insects in Georgia. His aim was to collect every kind of insect living in Georgia, and his interest and enthusiasm never weakened. At one time he was interested in the genus *Phyllophaga* and for 15 years he combed the state, collecting members of this group. During this time he collected 70 species, including 17,967 specimens from 113 localities. One spring Fattig's records indicated that a given species of may beetle should be out in Toccoa, Georgia, a small mountain town. Wanting some additional specimens, the next weekend found Fattig in Toccoa. At 3 o'clock in the morning Fattig had climbed a light

pole and was collecting may beetles flying around a street light. The town constable came by and called out, "What are you doing up there?" Fattig, who was about 60 at the time, called back "I'm catching may beetles," and kept on swinging his net. Fattig said, "You know, that policeman thought I was crazy and tried to lock me up." Fattig published many articles on insects of Georgia. Emory University published 10 bulletins of his work. Fattig's enthusiasm was catching, and he must have stimulated many students into the fields of entomology and the biological sciences. I have had the pleasure of teaching two students who took entomology through contact with this collector.

We have devoted purposeful men and women in all fields of entomology. The taxonomist will spend hours and hours working in the field of his interest. At times the economic entomologist wishes the taxonomist would not be so enthusiastic in his desire to name new species and create new genera because of the difficulty of keeping up. In research, commercial work, and manufacturing, we find scores of men dedicated to our science.

The Florida Entomological Society has a purpose. It is written into our constitution. Article 1, Section 2. reads: "The objectives of the Society shall be: (1) to promote the study of entomology; (2) to encourage research relative to insects and related arthropods in Florida; (3) to distribute widely knowledge pertaining to insects; and (4) to publish THE FLORIDA ENTOMOLOGIST". The Society during the past two years has placed much emphasis on the first objective. The "Entomology in Action" talk prepared by Mr. Wright has stimulated much interest in Florida and other states. The exhibit, which is on display for the first time at this meeting, should encourage young people to take an interest in entomology. Our publication THE FLORIDA ENTOMOLOGIST, under the direction of Dr. Berner, is distributed throughout the world and continues to be an outstanding entomological publication. Research in entomology and related arthropods is certainly encouraged by THE FLORIDA ENTOMOLOGIST.

I believe we have a bright future in entomology in Florida. Our profession is respected and the number employed in entomology in Florida continues to increase year by year. Student interest both in the undergraduate and graduate programs of study continutes to be high. The teaching plant at the University is an exceptional one with ample space for instruction and research. If you have not visited the new quarters of the teaching department, do so the next time you are in Gainesville. You will be amazed at our facilities. In the near future the 4-H Club entomology program will interest many young people in our science and should encourage increased enrollment in entomology at the college level. The papers to be given at this meeting clearly indicate that entomology in Florida is moving forward in rapid strides with many benefits to agriculture and mankind. The future of our science has never been brighter. Reexamine your purpose and continue to strive towards its fulfillment.