Scientific Notes

Another Spider becomes a Greenhouse pest. In 1928 (JOUR. ECON. ENT. 21:235) I reported a case where *Erigone atra* Blackw. became objectionable by webbing roses in a greenhouse. On Nov. 10th another case came to my attention at Roslyn, N. Y. This time the principal offender was *Eperigone tridentata* Emerton. Single specimens of *Erigone autumnalis* Emerton and *Araneus cornutus* Clerck were also taken.

C. R. CROSBY

The Colorado Potato Beetle in Utah. The Colorado potato beetle, *Leptinotarsa decimlineata* (Say), has been collected on several occasions in Utah. In 1928 a small infestation was found and apparently eradicated at Morgan, by LeRoy Marsh of the State Department of Agriculture. One adult beetle was collected on the Davis County Experimental Farm at Farmington during 1930, but none have since been taken there. On June 20, 1931, Mr. Marsh discovered an infestation of approximately 1000 immature and adult forms of this beetle on two adjoining town lots at Ogden. Strenuous efforts were made to eradicate this local infestation, and surveys of the surrounding territory showed no spread during the season.

GEORGE F. KNOWLTON, *Utah Agricultural Experiment Station*

An Addition to the Biology of *Rhopalosiphum prunifoliae* (Fitch). In the literature dealing with the apple-grain aphis it has been noted by several authors that apple leaves falling to the ground in early autumn carry with them countless immature sexual females. It has been inferred that such individuals were lost and so had no further part in the life economy of the species. During the past few seasons, the finding of an occasional young female on the lower trunk of defoliating apple trees led the writer to suspect that some other condition might exist; namely, the return of sexuals to the tree. To test this theory a number of trunks were banded with tree tanglefoot soon after the trees started to drop their leaves. Examination of these banded trees, over a six-week period, showed that great numbers of the immature forms regained the trunk and finally, on unbanded trees, relocated themselves on leaves. This occurred to such an extent that it must play a considerable part in the biology of the species.

C. R. CUTRIGHT, *Associate Entomologist, Ohio Agr. Exp. Station, Wooster, Ohio*

Notes on a New Potato Pest. *Gnorimoschema tuberosella* Busck. was described[1] from potato, *Solanum tuberosum* L., the type locality being Lima, Peru where it has been repeatedly reported as an important pest. In Dec. 1930 specimens of a moth, the larvae of which tunnel the stems of nightshade, *Solanum nigrum* var. *douglasii* Gray, were sent to August Busck at Washington. These and subsequent specimens were determined by him as identical with the material from Peru. *G. tuberosella* Busck is very common throughout Ventura and Santa Barbara Counties and undoubtedly extends into other counties of Southern California. At least two parasites are present in this area, one of these is, according to A. B. Gahn, a *Spilochalcis* sp. The insect seems to breed continuously in the field as all stages were found whenever an examination was made.

R. E. BARRETT, *Saticoy, Calif.*

[1]Two new Peruvian Microlepidoptera of economic importance (Gelechiidae and Oecophoridae). Proc. Ent. Soc. Wash., vol. 33, pp. 59-63 March, 1931.

Chemically Treated Bands Destructive to Spider Mites and the Woolly Aphis. Throughout the past five years that the writer has been making tests of chemically treated bands for capturing larvae of the codling moth (*Carpocapsa pomonella* L.), great numbers of the common red spider (*Tetranychus telarius* L.) have been observed in these bands. This season, with the unusual abundance of the mite and of the woolly apple aphis in the orchards of the Wenatchee, Wash. district, the great numbers of the mite and of the woolly aphid (*Eriosoma lanigerum* Hausm.) captured and killed in the bands were again brought strikingly to our attention. Throughout the late summer and fall countless numbers of migrating mites and of migrating woolly aphid nymphs were caught and killed in the bands.

The bands in the foregoing tests were, for the most part, made of corrugated paper or of burlap treated with beta-naphthol dissolved in red engine oil. The bands are placed around the tree trunks early in the summer, preferably just as the earliest codling moth larvae are leaving the fruit, and are allowed to remain until the following spring, when they are removed before any surviving larvae can transform to moths.

Corrugated paper bands have largely superseded the burlap chemically-treated bands, since the latter have been reported as causing some injury, particularly to young trees.

Whether the bands serve to control the mites and the woolly aphid to any appreciable extent has not yet been determined. If they were placed on the trees early in the spring before the migrating mites and the woolly aphid nymphs ascend the trunks, they might well afford some control of both.

M. A. YOTHERS, *U. S. Bureau of Entomology, Wenatchee, Washington*

The Apparent Incompatibility of Barium Fluosilicate and Nicotine Sulphate. During a series of experiments for the control of the tobacco thrips (*Frankliniella fusca* Hinds) on shade-grown tobacco at Quincy, Fla., during the past season, nicotine sulphate was used. An infestation of the flea beetles, *Epitrix parvula* Fab. and *Epitrix cucumeris* Harr., also occurred at the time that the experiments against the thrips were being conducted. Since in another series of experiments a good control of the flea beetle was being obtained with barium fluosilicate, a combination of nicotine sulphate and barium fluosilicate was tested, the materials being mixed as follows: Barium fluosilicate 1½ pounds, nicotine sulphate 12 ounces, water 50 gallons. The mixture was applied to the crop at the rate of 100 gallons per acre immediately after mixing. Two days after the application very severe "burning" was observed on the buds and leaves of the tobacco plants. Later observations showed that the damage did not increase appreciably after this date.

At the same time a nicotine sulphate solution was being used over a considerable acreage of tobacco without any apparent "burning" and barium fluosilicate was being applied to other fields with only a slight trace of foliage injury, the latter material being used at the rate of 4 to 8 pounds per acre. It was, however, moistened by dew and light showers on several occasions.

It is evident from these observations that a combination spray of nicotine and barium fluosilicate is detrimental to tobacco foliage.

F. S. CHAMBERLIN, *Assistant Entomologist, U. S. Bureau of Entomology*

Mesquite Injured by *Orthotylus transluciens* Tucker in Arizona. In Cochise and adjacent counties of southeastern Arizona I have been observing during the past ten years that a large percent of the mesquite (*Prosopis glandulosa* and *P. velutina*) fails to develop leaves and flowers at the proper time. Small green structures, apparently distorted leaves, are developed but these dry up and fall. The appearance of the bushes suggests that gnawing insects remove the leaves as fast as they are developed. Abnormal bushes of this type are scattered among normal bushes, or there may be fairly large areas in which practically no normal bushes exist. The first leaves which develop on the abnormal bushes in late spring or early summer are distorted and yellowish in color.

The condition has come to attract the attention of the laity. Various explanations have been advanced, such as winter injury or spring frosts, drought, and even toxic emanations from industrial plants. The last of these must be abandoned because of the existence of the condition at points far removed from any source of such wastes. The relationship of the occurrence of the condition to the topography does not favor the temperature explanation.

Throughout the period of my observations I have detected the presence of small green bugs (mirids) in large numbers. Their droppings often appear conspicuously on the injured twigs. It seems highly probable that these insects are responsible for the abnormal condition of the mesquite. Specimens sent to Mr. E. P. Van Duzee were identified as *Orthotylus translucens* Tucker.

WYATT W. JONES, *Douglas, Arizona*

Hibernation of 13-Spotted Lady Beetle. For the past six years the 13-spotted lady beetle, *Hippodamia tredecimpunctata* L., has been observed hibernating in the irregular pockets on the trunk of a cedar tree near the laboratory at Chadbourn, North Carolina. The tree, about 14 inches in diameter, stands on the western margin of a lawn about 30 feet from the residence. The number of beetles coming to this tree annually for hibernation has greatly increased from year to year.

At noon, October 15, 1931, when the temperature was 84°F. and the relative humidity 45 per cent, it was observed that the beetles were converging in large numbers towards the trunk and lower branches of the cedar. By 2.00 p. m., the trunk in many places was almost completely covered by the lady beetles, especially on the southeastern side. At this time there appeared to be no concerted movement toward the irregular pockets in the trunk, but in most cases the beetles were content to remain where they alighted. Within the next few days the beetles entered the irregular pockets on the tree, concentrating principally on the southeastern side.

By November 1 the beetles in the colony had assumed a quiescent state, and were still more heavily concentrated on the southeastern side of the tree. The prevailing cold winter winds in this section are from the northwest. No other types of trees in the immediate vicinity seemed to have any attraction for the beetles.

W. A. THOMAS, *Entomologist, U. S. Bureau of Entomology*

Comparative Effectiveness of Fall and Spring Applications of Paradichlorobenzene for Peach Borer Control. The use of paradichlorobenzene crystals in the fall at the end of the oviposition period of the peach borer is recommended for the control of that insect. Spring application is suggested if for an unavoidable reason the treatment could not be made at the recommended time in the fall. In such cases, the question of the comparative effectiveness of fall and spring applications

is presented. The following results of experiments conducted during the spring and fall of 1931 furnish data for answering that question.

Plat No.	Number of Trees	Age of Trees	Treated with 1 ounce of paradichlorobenzene Crystals on— 1931	Examined for Borer Control on— 1931	Number Borers Dead	Number Borers Alive	Per cent of Borers Dead
		Years					
1	25	8	April 4	May 15	44	8	84.6
2	10	6	October 14	October 29	17	0	100.0
3	10	6	Check—untreated	"	1	41	2.4

Most of the borers are nearly full-grown by spring, and at that time some have traveled in the tree to a considerable distance from the point where the paradichlorobenzene crystals are placed. These are factors that are perhaps responsible for the poorer results from the spring application. Peach growers will obtain better results from paradichlorobenzene if applied in the fall at the end of the oviposition period of the borer.

OLIVER I. SNAPP and J. R. THOMSON, *U. S. Peach Insect Laboratory, Fort Valley, Georgia*

A Commercial Use for a Destructive Insect. The Japanese have recently begun to use the cases of the "bagworm" or "fagot insect" (Thyridopteryx) for making various articles, particularly ladies handbags. These are rapidly becoming very popular. The outside of the bagworm cocoon is exposed, giving the handbag a rough, leathery appearance. Ladies sport shoes made from these insect cases seem to be satisfactory and are quite a novelty. More and more uses are being found for this material. It seems possible to use it for many articles now made of leather, such as golf bags, belts, card cases, etc.

The insects are collected when they are full grown (1½ to 2 inches long), the larvae removed and the cases slit, after which the loose pieces of leaves or sticks are removed. The larvae may be used for chicken food, though this might be a bad practice from an entomological standpoint as any parasites present would also be destroyed. Each bagworm case will furnish a piece about one inch square, and a number of these are stitched together until a piece of satisfactory size is obtained. Article made of these insect bags are lined with cloth and usually trimmed with leather. "Zipper" clasps are used where desired. The bagworm cases are very tough and materials made from them should be durable.

Bagworms are very common in Japan where they are called "mino mushi", meaning insect with a raincoat, which is derived from their imagined likeness to a rice farmer wearing the shaggy, straw raincoat so frequently seen in rural Japan during the rainy, rice-planting season.

The idea of utilizing these insect bags for practical purposes was contributed by a foreign resident who was looking for work for the many Japanese unemployed. Perhaps it would be possible to use the same idea in those sections of the United States where bagworms are abundant and destructive, thus providing some employment and reducing the numbers of a harmful insect at the same time.

CHARLES A. CLARK, *Kobe, Japan, December, 1931*

The Potato Pin Worm, *Gnorimoschema lycopersicella* Busck, a new Pest in Pennsylvania. In September, 1931, my attention was directed to a small lepidopter-

ous larva, which was causing injury to tomatoes near Coatesville, Pa. This larva proved to be a leaf miner of the family Gelechiidae, but did not exactly correspond with any known Pennsylvania species of this group. A number of adults were reared and sent to Mr. A. Busck of the U. S. National Museum, who determined them as *Gnorimoschema (Phthorimaea) lycopersicella* Busck. This insect, which was described in 1928 (Proc. Hawaiian Ent. Soc., VII, No. I, June, 1928), has heretofore been found established only in Mexico, California, and Hawaii, where it has caused much injury to tomatoes by mining the leaves, boring into the stems and buds, and making small holes into the stem end of the tomato. This latter type of injury has caused it to be called the tomato pin worm.

This insect is capable of great damage, as is shown by reports of from 40 to 85% infestation in California. During 1930 it caused much injury in the Imperial Valley and other parts of California. In the localized infestation near Coatesville, Pa., it was first noticed during the winter of 1929–1930, about two years after the grower had received shipments of celery and tomatoes from California. The greatest injury has been in this grower's greenhouses, but the insect has also spread to tomatoes planted in the field, where injury was severe during the summer of 1930. In addition to tomatoes it has also infested the Horse Nettle, *Solanum carolinense* L., apparently a new food-plant for this species. As the countryside surrounding this infested farm is heavily infested with this weed, eradication of the pin worm will doubtless be very difficult, if it is not killed out by a severe winter. The infested houses have been thoroughly cleaned out and no tomatoes are being grown in them this winter, so that it is hoped that the only remaining stages are outdoors, where they may be affected by the winter.

The moth of this insect is very difficult to distinguish from the adults of the closely allied *G. glochinella* (Zeller), and *G. operculella* (Zeller), except by means of the genitalia, which are quite distinct. The larva differs from those of the other species by having distinct saddle-like purplish markings on the dorsum of the abdominal segments. This is not found in the other species, nor in the young larvae of this species.

Busck described and figured the genitalia of this and the related species, and Swezey noted its injury in Hawaii, in the above Proceedings of the Hawaiian Ent. Society. An interesting account of its injury in California, with seven references is found in a paper by R. E. Campbell and J. C. Elmore, in the Monthly Bulletin of the California Dept. of Agriculture, XX, No. 7, Sacramento, Cal., July, 1931, p. 458.

C. A. THOMAS, *Penna. State College*

Ethylene oxide-liquid carbon dioxide mixture in house fumigation.—In 1930 a large residence near Minneapolis was fumigated with chloropicrin to rid it of carpet beetles. The gas clung for several weeks to clothes in the wardrobes, resulting in irritation to occupants of the house. Furthermore, the beetles were not well controlled.

"Carboxide" (a liquefied mixture of ethylene oxide and carbon dioxide in gas cylinders) was tried in October, 1931. The house was divided into five floors including attic and basement. As the space involved amounted to approximately 275,000 cubic feet 58 fifty-pound tanks of gas were used. The greatest infestation of carpet beetles occurred in goods stored in the attic where excessive heat of the

last summer had increased the rate of insect development. Rooms immediately below contained a lesser infestation but very few beetles were found on the lower floors.

As the attic was not so tight as the rest of the house a higher charge of gas was used. Ten tanks were placed here in a space of only about 10,000 cubic feet. Throughout the lower floors one or two tanks were placed in each room with extra ones in the halls. The cylinders were placed upright on small squares of wood to prevent marring the rugs. Wherever spray might strike the hangings nozzles were either directed toward woodwork as much as possible or were covered loosely with short pieces of cheese-cloth. All wardrobes and bureau drawers were opened.

As soon as a few of the tank valves had been released it was found that back pressure overbalanced some of the cylinders. Because of possible damage to furniture and woodwork the remaining cylinders were lowered to a horizontal position. In the future the cylinders will be braced, and then the gas will be released more slowly. The attic and parts of the second and third floors were sealed from each other and from the lower rooms. In this way the greater charge of gas was held in the upper part of the building, both to be effective against the greater infestation there and to allow the fumigators time to finish their work.

It was possible to leave the house unoccupied for 48 hours. When it was opened there was no odor of the gas apparent. Ethylene oxide has a "sweetish" odor which is not unpleasant but is a fairly good indicator. In a few cases rugs were spotted by the liquid that came in contact with them when some of the cylinders "froze." Unfortunately, when the tanks were lowered to horizontal positions there was no time to provide newspapers for possible drippings. Spots in the rugs were rather easily removed later, however. The fumigation appears to have been highly successful both from the standpoint of ease of operation and from that of the effectiveness of the control. No live beetles have been found since this house was fumigated.

H. H. SHEPARD and D. L. LINDGREN, *University of Minnesota, St. Paul, Minn.*

A Peculiar Spotting of Oranges in Central California. A peculiar spotting of the rind of oranges and certain other citrus varieties has attracted considerable attention for a number of years. It is characterized by a sinking of the tissue between the oil glands of the rind so that the glands stand out prominently in these affected areas. Dr. Fawcett in 1916 reported (Calif. Agr. Exp. Sta. Bul. 266) on this spotting from the pathologist's viewpoint and he concluded that it was caused by the liberation of minute quantities of oil from the oil cells which spreads out and affects the adjacent tissue. The peculiar injury is more acute on immature fruit and under conditions of humidity. Fawcett believed that any agency causing the rupturing of oil cells, including insects and mites, would contribute to the spotting of the rind.

For several years the writer has entertained the belief that some of this particular injury is caused by the work of leafhoppers. The recent cycle of dry seasons that has occurred in central California has resulted in building up the leafhopper population to a high degree. At the approach of cold weather the hoppers migrate into the citrus groves for greater protection. From about October 15 until the occurrence of killing frosts, swarms of leafhoppers are commonly seen on the citrus foliage. Several species are concerned, including the grape leafhopper, *Erythroneura comes* (Say).

In order to test the validity of the writer's belief, Harold Lewis, of the California Fruit Growers' Exchange (who has worked in close coöperation with the writer during the past few years), confined hundreds of grape leafhoppers with oranges under cloth bags, and bagged other oranges in the absence of hoppers. All navel oranges with confined hoppers soon developed typical rind spots—an average of 4 spots per fruit. Similarly exposed Valencia oranges developed the spotting to a lesser degree—an average of 0.75 spot per fruit. Protected oranges developed no new spots. A conclusion to be drawn from these tests is that leafhoppers are a cause of the typical spotting of the rind.

No doubt other agencies contribute to the sum total of the rind spotting. To test the possibilities from purely mechanical abrasion the writer has punctured oil cells with a very fine needle point, and this has repeatedly led to more or less typical rind spots. The citrus thrips has been suspected of causing a certain amount of this injury, and Mr. Woglum of the California Fruit Growers' Exchange requested that this possibility be looked into. Accordingly the writer confined hundreds of citrus thrips with bagged unblemished navel oranges, but no spots developed. In addition, Mr. Lewis and the writer tagged many green oranges in the rind of which ovipositing thrips had become ensnared. In almost all cases spots were associated with these ensnared thrips when first detected, and it is the writer's opinion that the act of attempting to oviposit into the calloused gummy tissue of the rind spots explains the presence of the thrips at the spots. It is significant that almost no enlargement of these spots (with associated thrips) developed during the course of observation. Furthermore, where thrips were ensnared in the absence of rind spots, no such spots developed. Still, it is possible that ovipositing thrips may at times puncture oil cells and cause a limited amount of the spotting.

E. A. McGregor, *U. S. Thrips Laboratory, Lindsay, Calif.*

An Improved Oviposition Cage for the Codling Moth. In connection with mass rearing of newly-hatched codling moth larvae for insecticide tests, a new type of oviposition cage has been developed at the Vincennes, Indiana, station of the U. S. Bureau of Entomology. It consists simply of a cylindrical tin coffee can approximately 6 inches high and 4 inches in diameter. The bottom is first cut out smoothly. Then a piece of cellophane is placed on the top of the can and the cover forced on over it. This end then becomes the bottom. The inside of the container is next lined with a sheet of cellophane of the proper size and held in place by four or five paper clips around the mouth of the can. If correctly done, the inside of the cage is smoothly lined on the bottom and sides with no spaces left into which a moth might crawl and become trapped. A single piece of cheesecloth held in place by a rubber band covers the top of the cage.

With this type of cage, several kinds of paper and of cellophane were tried in an effort to find some lining material more efficient than waxed paper. Two hundred moths were used per cage and the duration of each test was but four days; therefore the figures given in Table 1 do not represent the total number of eggs available from the moths, but the number of eggs deposited on the different lining materials during the tests are comparable. To induce maximum oviposition, the cages containing the moths were kept in an incubator in which was maintained a constant temperature of 82° F. and a relative humidity of 95 per cent. The only source of

light within the incubator was a dim electric light wrapped in cloth to reduce its intensity.

TABLE 1. SUMMARY OF OVIPOSITION STUDIES OF CODLING MOTHS CONFINED IN CAGES LINED WITH DIFFERENT KINDS OF PAPER AND OF CELLOPHANE, VINCENNES, IND., 1931

Cage lining	Cages	Total eggs	Laid on— Lining	Foliage	Apple	Average eggs per moth
	Number	*Number*	*Per cent*	*Per cent*	*Per cent*	*Number*
Red Cellophane.....	13	52,649	50.76	37.95	11.29	20.25
Blue Crepe Paper....	4	15,458	40.64	43.03	16.33	19.36
Gold Cellophane.....	4	14,909	59.25	29.04	11.71	18.64
Pink Cellophane.....	4	14,784	48.85	36.01	15.14	18.48
Green Crepe Paper...	5	18,512	20.77	61.33	17.90	18.51
Red Crepe Paper.....	5	17,555	17.77	64.14	18.09	17.55
Colorless Cellophane.	11	35,694	54.31	33.11	12.58	16.22
Apple Wrap Paper...	8	25,475	57.07	30.54	12.39	15.92
Blue Cellophane.....	4	12,717	52.42	34.69	12.89	15.90
Heavy Wax Paper....	7	15,962	37.70	43.80	18.50	11.40
Green Cellophane....	5	10,913	51.97	37.04	10.99	10.91

The cellophane was .001 inch thick and the several samples were apparently similar in every way except in color. The crepe papers likewise apparently varied only in color. A serious objection to crepe paper is its habit of shrinking in the high humidity of the incubator. Red cellophane seems to be the most promising of the materials tested, since it is efficient, cheap, and easily handled.

Table 2 presents data which indicate that, on the average, greater numbers of eggs per moth were produced when two hundred moths were confined in each cage than when lesser numbers of moths were used.

TABLE 2. INFLUENCE OF NUMBER OF CODLING MOTHS ON EGG PRODUCTION IN OVIPOSITION CAGES. (THE CAGE LINING WAS APPLE WRAP PAPER)

Moths per Cage	Cages	Eggs	Average Eggs per Moth
Number	*Number*	*Number*	*Number*
25	2	339	6.78
50	2	1,228	12.28
75	3	1,832	8.14
100	3	3,934	13.11
125	1	483	3.86
200	8	25,475	15.92

R. F. SAZAMA, *Assistant Entomologist, U. S. Bureau of Entomology*

The Residue Problem and Fluorine Compounds. Fluorine compounds are being used to an increasing extent to meet the arsenical residue problem. It is thought by many people that these compounds are perhaps as objectionable from the standpoint of public health as lead arsenate. Since no tolerance has yet been named for them, a review of the literature relating to both the chronic and acute toxicity studies should be helpful to persons interested in the effect of fluorine compounds on the human system.

ACUTE TOXICITIES.—Kuhn (Tran. Fourth Int. Congress 1928) determined the acute toxicities as follows:*

	M. L. D.			
Calcium arsenate	38	mg. per	Kilo	(dogs)
Lead arsenate	500	" "	"	(dogs)
Lead arsenate*	75	" "	"	(rabbits)
Sodium fluosilicate	150	" "	"	(dogs)
Sodium fluoride*	200	" "	"	(rabbits)
Barium fluosilicate*	175	" "	"	(rabbits)
Cryolite	500	" "	"	(not fatal)

In the foregoing data the minimum lethal dose for the fluorine compounds is somewhat less than for the arsenicals, especially in the case of cryolite.

CHRONIC TOXICITIES.—Of prime concern from the standpoint of public health is the possible chronic rather than acute action of fluorine on the system, as compared with arsenic. Sollman (Jour. Phar. and Expt. Ther. 1921) fed albino rats for 9 to 24 weeks with arsenic trioxide, and as little as .00005 to .0005 mg. per kilo produced a distinct retardation of growth. These daily doses are only 1/800 to ¼ of the U. S. P. therapeutic dose of 2 mg. On the other hand, Sollman (Jour. Phar. and Expt. Ther. 1921) fed sodium fluoride in daily doses of 8 mg. per kilo with no deleterious effect on growth or food consumption within 9 weeks. Schultz and Lamb (Science, p. 93, 1925) report no ill effects from .05 per cent sodium fluoride (equivalent to 226 parts of fluorine per million of foodstuffs) when fed to rats. Beyond those dosages a toxic effect was observed. Similar results were secured by McClure and Mitchel (Jour. Biol. Chem. 1931). The feeding of raw rock phosphate as a mineral supplement to dairy cattle has been found detrimental, dut to the fluorine content, Taylor (Quart. Bul. Mich. Agr. Exp. Sta. 1929). The basal ration used was 1½ per cent raw rock phosphate, equivalent to 450 parts of fluorine per million. Gautier and Clausman (Comp. rend. 162, 105, 1916) found natural foods to contain, on the average, 26.5 parts of fluorine per million. Since the average spray residue contains less than 3 parts per million of foodstuffs, it appears that we are all consuming considerably more fluorine in our daily diet than would be possible from consuming fruits or vegetables sprayed with fluorine.

From these data the following conclusions seem evident: That both fluorine compounds and arsenicals have high acute toxic values. As to the chronic toxicities, with which we are primarily concerned in the residue problem, the fluorine compounds are at least 100,000 times safer than lead arsenate and possess a marginal safety factor over the average spray residue content of 75. The 1931 report of the California Agricultural Experiment Station contains this statement with respect to the residue from fluorine compounds: "From a number of chemical analyses made by the Bureau of Chemistry, at Washington, D. C., it would seem that on vegetables which are washed before marketing there is not sufficient residue to be dangerous for human consumption even though dusted excessively."

S. MARCOVITCH, *Tennessee Agricultural Experiment Station, Knoxville, Tenn.*

The Relative Toxicity of Rotenone and Some Related Compounds as Stomach Insecticides. The Insecticide Division of the U. S. Bureau of Chemistry and Soils has submitted to the writers four pure compounds extracted from certain fish-poison

*Cited from C. W. Muehlberger (Jour. Phar. and Expt. Ther. 1930).

plants and five derivatives of rotenone for determination of their relative toxicity as stomach poisons. At the request of the Insecticide Division the following notes are presented, although the results, owing to a lack of sufficient material, are not as precise as they might be.

The leaf-sandwich method, described by Campbell and Filmer (Trans. IV. Internat. Cong. Ent. Ithaca, 523–533. 1929) and modified by Campbell (Jour. Econ. Ent. 23: 357–370. 1930), was used with fourth-instar silkworms as the test insects. In 1929 the junior author determined the median lethal dose (M. L. D.) of rotenone to be close to 0.003 mg. per gram of body weight. In 1930 the senior author, now at the University of Minnesota, tested eight more compounds. For the sake of comparison in the following tabulation of results, the M. L. D. of acid lead arsenate and of rotenone are given:

Rotenone	M. L. D. approximately	0.003	mg./	gm.
Dihydrorotenone	M. L. D. not more than	0.01	"	"
Deguelin	M. L. D. between 0.01 and	0.012	"	"
Tephrosin	M. L. D. between 0.03 and	0.06	"	"
Acid lead arsenate	M. L. D. approximately	0.09	"	"
Toxicarol	recovery from doses as high as	1.54	"	"
Derritol	recovery from doses as high as	0.87	"	"
Rotenol	recovery from doses as high as	0.51	"	"
Dehydrorotenone	recovery from doses as high as	0.40	"	"
Tubaic acid	recovery from doses as high as	0.54	"	"

It will be noted that the first four compounds are more toxic than the standard stomach poison, acid lead arsenate. Rotenone, which is about 30 times as toxic as acid lead arsenate, is the most toxic substance for the silkworm as yet tested by the leaf sandwich method. However, it must not be assumed that rotenone is equally as toxic as a stomach insecticide for other insects. Wide differences in effectiveness of rotenone noted in recent tests by others suggest that the degree of its toxicity may depend on the physiological characteristics of the species of insect and its food. Rotenone and related compounds are not repellent to the silkworm, which may therefore take many times the quantity of the median lethal dose. Their action is so slow and mild that the larvae neither regurgitate nor undergo spasms as is often the case in poisoning by arsenicals and fluorine compounds.

The last five compounds in the foregoing list could not be arranged in the order of their relative toxicity, because none of the insects died from the doses that were given. However, the results do show that these compounds are either non-toxic or of so low an order of toxicity as to have no possibilities for practical use.

Rotenone, deguelin, tephrosin, and toxicarol, the four naturally occurring compounds, were given the same order of relative effectiveness as contact poisons by Davidson (Jour. Econ. Ent. 23: 877–879. 1930) as that found by the writers for their relative toxicity as stomach poisons.

Of the five derivatives of rotenone, only dihydrorotenone approached the toxicity of rotenone. The decrease in toxicity of rotenone when allowed to stand in solution in certain organic solvents (Davidson and Jones, Jour. Econ. Ent. 24: 257–262, 1931) is probably due to its spontaneous oxidation to dehydrorotenone (Jones and Haller, Jour. Amer. Chem. Soc. 53: 2320–2324. 1931), a compound having little or no toxicity for the silkworm. The results so far obtained indicate that deriva-

tives and degradation products of rotenone are likely to be less toxic than rotenone itself.

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The Beech Scale (*Cryptococcus fagi* Bärenspr.), Recently Discovered in New England. The beech scale (*Cryptococcus fagi* Bärensprung) has long been known as a common pest of beech in Europe. The late Dr. C. Gordon Hewitt reported its discovery in Nova Scotia in 1911, indicating that it had been present there for at least 20 years. In recent years its occurrence in Nova Scotia, and in New Brunswick and Prince Edward Island, has attracted considerable attention and it has been stated that many infested trees in these Canadian Maritime Provinces have died. So far as known only beech it attacked, the American beech (*Fagus grandifolia*) being as severely infested as the European species (*Fagus sylvatica*), and at least most of the investigators who have studied infestations in Europe and Canada are of the opinion that certain fungi and slime-fluxes that appear on scale-infested trees cause more injury than the scale itself.

There appear to be no published references to the occurrence of the beech scale in the United States, but Mr. John Ehrlich, a graduate student at Harvard University, who has carried on investigations having to do with the occurrence of the species in the Canadian Maritime Provinces has stated in correspondence that he found the scale to be present in Boston in 1929, its identity being determined by Dr. Harold Morrison of the United States Bureau of Entomology, and by Dr. Edith M. Patch of the Maine Agricultural Experiment Station. Mr. Ehrlich intends publishing an article in the January number of the Journal of the Arnold Arboretum which includes his observations on the insect in New England.

In March, 1931, Mr. S. S. Crossman, of the Plant Quarantine and Control Administration, who was then stationed at Melrose Highlands, Mass, obtained specimens from beech trees growing in the Middlesex Fells Reservation, Stoneham, Mass. During the summer and fall of 1931 members of the station spent considerable time in various portions of the New England States searching for the scale. Two types of scouting were carried on. In both, the idea was to look for beech trees and when these were seen they were examined. Some towns were scouted lightly, only the principal roads being traveled. Other towns were scouted more thoroughly, all sections of the town being visited. Up to November 12 three distinct areas where infestations occur had been located. One area is in Liberty, Me., between Augusta and Belfast. Another includes Gloucester, Essex, Manchester, and Beverly, in the "North Shore" section of Massachusetts near Cape Ann. The third includes Boston and the neighboring cities and towns of Stoneham, Belmont, Cambridge, Watertown, Newton, Brookline, and Milton. The number of trees found infested at various points in Massachusetts ranges from one or two to several hundred. The infestation in Liberty, Me., is more widespread. Mr. H. B. Pierson, State Entomologist of Maine, who has done additional scouting in that section since Bureau of Entomology representatives found the scale there, reports that it occurs throughout the town as well as in the adjoining town of Washington. Evidence of slime-flux has been noted on infested trees in Beverly, Mass., but certain fungi which are said to be very injurious to such trees in Europe and Canada have not been found in New England.

Members of the Bureau of Entomology stationed at Melrose Highlands, Mass., have carried on experiments with certain spray mixtures for the control of the scale and, based on their findings, are advising the use of a miscible oil at the rate of 1 gallon to 15 gallons of water at the beginning (first two weeks of November in the vicinity of Boston) or end (first two weeks of April in the vicinity of Boston) of the dormant season. Because of the limited time during which these experiments have been conducted, however, it may be advisable later to change the recommendations. Considerable spraying for the control of the insect has already been done in Massachusetts by State, city, and town authorities, and by property owners.

Besides continuing control experiments, and making certain studies concerning the life history and habits of the beech scale, and the injury caused by it, the Bureau of Entomology will consider the possibility of introducing natural enemies.

A preliminary survey indicates that the insect is spread over a rather limited area at present in New England and that the infestations in Massachusetts at least are in areas where native beech is not abundant. There is more or less of a natural barrier between the present known infested areas in Massachusetts and that of natural beech forests in western Massachusetts, northern New Hampshire, and Maine. More scouting should be done to determine the present limitations of spread, and if conditions are found to be similar to those already known to exist, systematic methods of control should be practiced to prevent its early establishment in the natural beech stands of New England.

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THE NINTH ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF PENNSYLVANIA

This was held in Harrisburg, Pennsylvania, on the afternoon of January 18th. President H. N. Worthley presided.

The program was informal, no papers or set speeches being given. The society discussed the possible publication of a check list of the insects of Pennsylvania. Affiliation of the society with the Pennsylvania Academy of Science was also discussed. C. A. Thomas reported upon the Tomato Pin Worm Moth, an insect recently introduced into Southeastern Pennsylvania from California. J. O. Pepper presented results of tests with various sprays against San Jose Scale. H. N. Worthley discussed results of delayed dormant sprays against scale and also effects on scale population of various fungicides. The officers elected for 1932 were: J. R. Stear, President and A. B. Champlain, Secretary.

Following the meeting, the members dined together informally. The following members and visitors were present: A. B. Champlain, C. A. Thomas, C. C. Hill, J. S. Pinckney, G. B. Stichter, E. J. Udine, H. N. Worthley, J. R. Stear, T. L. Guyton, R. H. Bell, F. L. Holdrige, J. O. Pepper, J. N. Knull, Clair Van Horn, Mr. Luginbuel and Mr. Duncan.