

in about 300 cc. of water, for a period of 22 days. Manure was collected 24, 48, 72 and 90 hours after the last drench. Fifty 113, 101 and 81 horn fly larvae, respectively, hatched from eggs placed on each dropping, but no adult horn flies were reared from the manure. In the check fecal dropping, obtained from an untreated cow, 116 adults emerged from 125 eggs allowed to hatch on the manure.

DILUTION TESTS.—In addition to the tests discussed, dilution tests were conducted on two of the test animals to determine whether the manure contained an excess of the toxic material. In one test a mixture of 1 part of manure from the calf (case 1) receiving 10 grams of phenothiazine per day was mixed in 10 parts of manure from an untreated animal. This

did not prevent development of the larvae, but in other tests on different occasions in which 1 part of manure from test animals was mixed in 2.5, 5.0, 5.0, 6.6 and 10 parts of manure from an untreated animal, 100 per cent control was obtained. In case 3, 1 part of manure collected from the cow 24 hours after it had received the last dose of phenothiazine, mixed in 6.6, 10 and 13.3 parts of manure from an untreated cow, prevented development of horn fly larvae.

SUMMARY.—In three cases phenothiazine administered to cattle at the rate of approximately 0.1 gram or less per kilogram of body weight prevented development of horn fly larvae in the manure that was eliminated by such animals.—3-14-38.

SCIENTIFIC NOTES

An Economical, Portable Light for Collecting Nocturnal Insects

A mercury vapor light offers many advantages over other lights for use in attracting nocturnal insects. The light is rich in those frequencies in the short wave-length end of the visible spectrum to which most insects respond readily; mercury vapor is far superior, in this respect, to neon.

The predominating lines in the spectra of the three commonest commercial luminous tube lights are shown in fig. 1; the sections of these spectra filtered out by the glass tubing itself are indicated by broken lines. It can be seen that in the red, or neon, light the majority of the strong lines are in the red and orange end of the spectrum, while almost all of the strong lines in the spectrum of the mercury vapor light lie in the blue end. The common green commercial luminous tube light is argon gas and mercury vapor inside yellow glass; the latter eliminates all but a few strong, yellow and green lines of the mercury spectrum, Argon gas alone gives a faint yellowish-white light and shows no strong lines in the visible spectrum. In the making of commercial mercury vapor lights, argon is added to lower the required operating voltage and make striking easier. A combination of neon and mercury gives a purple light considerably less brilliant than argon and mercury, when the same voltage is applied to both.

Each light, it must be remembered, actually contains a mixture of diverse color lines, in spite of the predominance of one visual color. This makes their use for scientific experiment very limited.

When the three lights whose spectra are shown in fig. 1 were set up together on a warm midsummer evening and the same voltage applied to all, it soon became apparent that very few insects were attracted by the green light. A few, especially the higher Diptera, were attracted by the red; the very great majority were, however, attracted by the blue. Despite the fact that all of these lights consume the same amount of current and appear to be of about

equal intensity, the mercury vapor is much more effective than either the red or green for general nocturnal collecting.

The mercury vapor light operates at a low temperature, so that insects are not at all likely to be killed by the heat. The average dissipation by these tubes is only three watts per foot. The light, also, is emitted uniformly over a relatively wide area, and not concentrated in a small point, as in incandescent or flame lights. This last characteristic of luminous tube lights is quite advantageous, as the insects do not crowd over and crush each other in an attempt to reach the one spot of maximum brilliance.

If the mercury vapor tube is to glow, however, a high voltage must be applied. The general operating voltage for these tubes is approximately 800 volts per foot, although this can be varied within wide limits. Usually 2500 volts is satisfactory for a tube three or four feet long; a higher voltage increases brilliance slightly, but a voltage much lower is likely to cause intermittent operation. There is, of course, no difficulty in obtaining the necessary high voltage by means of a transformer when 110-volt alternating current is available. It is often desirable, however, to operate a light trap by using a mercury vapor tube where such current is not available. The following arrangement, has therefore, been devised to enable a mercury vapor light to be operated from a six-volt direct current source and used as a portable light to be set up anywhere in the field where collecting is desirable.

Fortunately, the current consumed by these tubes is extremely small: the light described here uses only .004 amperes. This low current drain makes it possible to secure adequate operating voltage from the secondary of a Ford Model T induction coil. The electrical diagram of this light is shown in fig. 2. T_1 is the ignition coil; C_2 is the condenser which comes sealed within this unit. The capacity of this condenser influences, to a considerable extent, the voltage obtained from the unit. When no current is being drawn from the secondary, the voltage across it is approximately 50,000 volts. When a three-foot

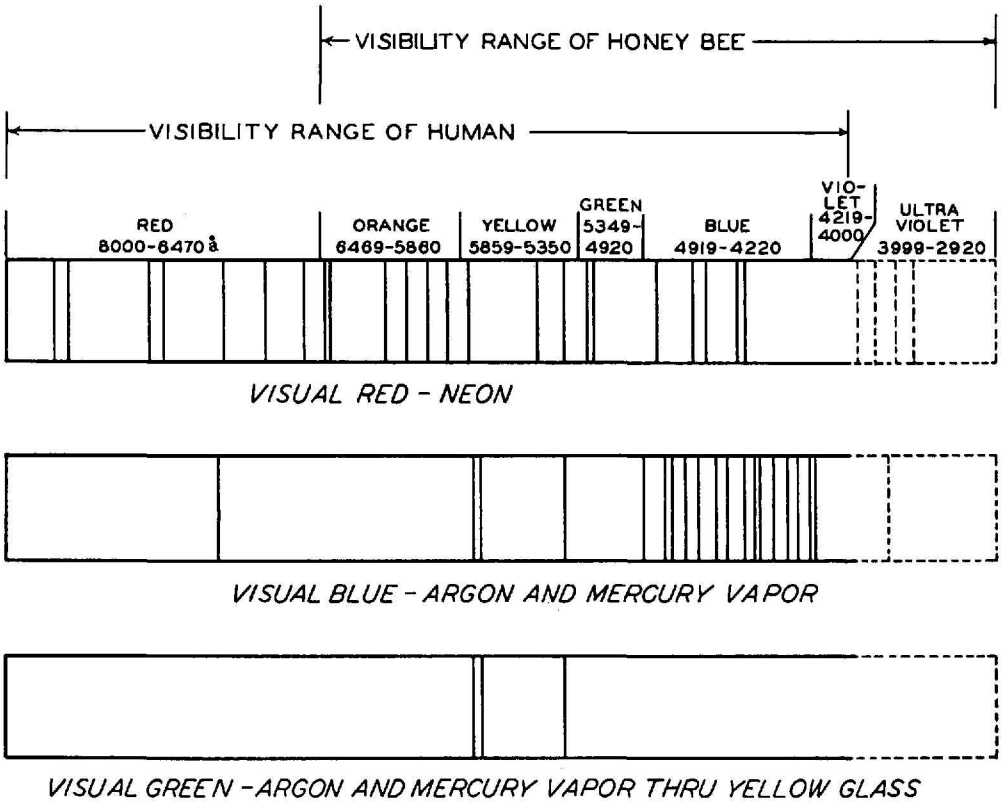


FIG. 1.—Band spectra of three common commercial luminous tube lights, appearing red, blue and green to the human eye. The glass of the tube absorbs all the ultra-violet rays, indicated by broken lines.

mercury vapor tube is, however, connected across the secondary the voltage falls to about 2500 volts. In the diagram, R_1 represents the mercury vapor

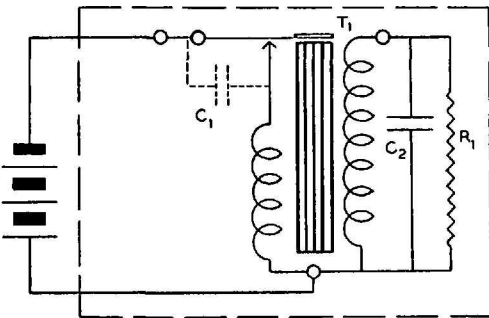


FIG. 2.—Diagrammatic hook-up of portable light shown in fig 3.

tube. Increasing the size of C_2 by .1 mfd. would increase the voltage applied to the tube with a consequent increase in brilliance, but this would likewise increase the amount of current drawn from the battery in the primary circuit. A three-foot tube shunted across the secondary of the Ford coil without the addition of an external condenser causes a current drain of 1.5 amperes from the six-volt bat-

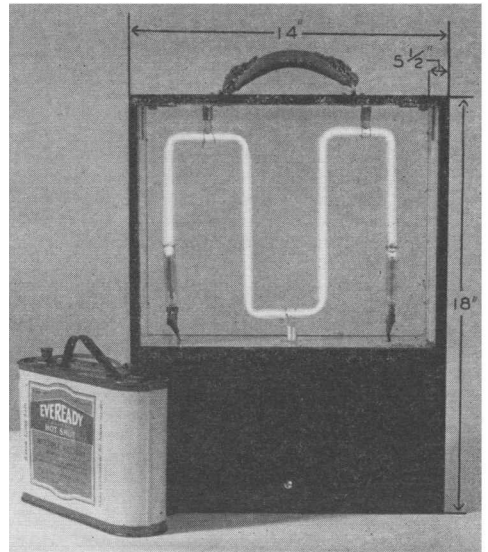


FIG. 3.—Portable light for collecting nocturnal insects. Battery and arrangement of argon-mercury glow tube are shown.

tery in the primary circuit. This is high enough if economical operation is to be secured when using no. 6 dry cells. If the six-volt storage battery of an automobile is to be used, there is, of course, no objection to drawing considerably more current than this. Condenser C₁, shown in the diagram shunted across the interrupter in the primary circuit of Y₁ may be a 1.0 mfd., low voltage condenser; the addition of this will help somewhat in eliminating the rather objectionable flicker of this light.

Fig. 3 is a photograph of the portable light which has been found most useful for use in the field. This is light in weight, but strong; many mechanical difficulties were eliminated by keeping the battery external to the light itself. The upper compartment contains the glow tube, and the lower houses the induction coil and a cord and plug. The cord can be connected either to the terminals of a *Hot Shot* battery or be connected to a male plug to be inserted in the tail light socket of an automobile. The wires leading from the induction coil to the glow tube must be kept short and well separated, because of the high voltage used.

The box is made of plywood and, consequently, must be finished so as to be moisture proof. Triple strength window glass should be used in the upper compartment, to reduce the possibility of breakage. This light weighs 11 pounds, and the battery weighs 10 pounds; the entire unit can be built for \$13.00, including the battery.—11-15-37.

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Aphomia gularis Zeller as a Pest of Prunes

De Ong (1919) has published notes on a heavy infestation by the moth *Aphomia gularis* Zeller, in a California warehouse, in peanuts imported from China.

In 1927 reports were received of a new type of infestation in stored prunes in the San José district of California. Investigation by members of the staff of the dried fruit insect laboratory of the Bureau of Entomology and Plant Quarantine, which is located at Fresno, Calif., revealed a limited infestation in prunes in one packing house. For the succeeding seven years occasional observations were made in the San Francisco Bay area, of which San José is a part, and specimens of *Aphomia gularis*, or evidences of its presence and work (chiefly strong, heavy webbing and cocoons), were found in one plant in San José but in no other location.

During a survey of storage plants in this area in February, 1935, infestations were found in prunes in several San José storages and in one in Oakland. In the Oakland storage many larvae were crawling over bags of almonds in the same room. The almonds had been fed on by insects, but no larvae were actually observed feeding. Other surveys in San José in 1936 and 1937 have shown the species in every plant visited, and evidences of serious loss in most of them. In the same plants quantities of other dried fruits—mainly apples, pears, peaches, and apricots—were stored also, often in adjoining bins, but prunes were the only fruit found attacked.

Well-grown *Aphomia* larvae are over an inch in length and are voracious feeders. Many prunes showing feeding consist of nothing more than pits scantily covered with bits of flesh and quantities of

coarse black excreta and white webbing. Cocooning for pupation occurs largely in cracks of bins, beneath or in the bottoms of boxes and adjoining other wooden materials. Frequently shallow cells are cut from the wood and the cocoons spun within.

Aphomia gularis is obviously increasing in importance as a stored-prune pest, and is slowly widening its distribution. Because of the danger of introducing the species into the prune and almond districts surrounding Fresno, no living specimens have been brought to the laboratory for studies of development.

Since it is becoming an increasingly important factor in storage of prunes, and is not known as a serious pest of any other material, the writers suggest that the common name "dried prune moth" be given this insect.—2-4-38.

HEBER C. DONOHUE, PEREZ SIMMONS AND DWIGHT F. BARNES, U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine.

LITERATURE CITED

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Glossonotus crataegi Fitch. Susceptible to Dormant Oil Sprays

A dormant application of lubricating oil emulsion, 6 per cent oil, applied for the purpose of controlling an infestation of the fruit-tree leaf-roller, *Archips*

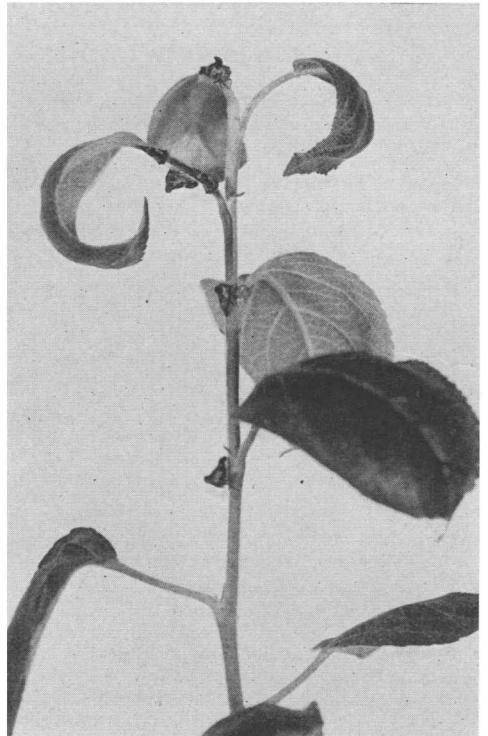


FIG. 1.—*Glossonotus crataegi* on apple twig. Slightly larger than half natural size.

argyrosbila Walk., also gave very good control of a heavy infestation of the tree hopper, *Glossonotus crataegi* on apple. Fig. 1 shows the insect on an apple twig. Fig. 2 gives a close view of the insect.

Unsprayed twigs placed in water early in the season prior to the opening of the buds and held at room temperature produced large numbers of the

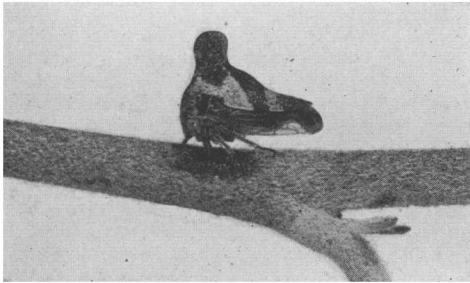


Fig. 2.—*Glossonotus crataegi*. Slightly larger than twice natural size.

tree hoppers while twigs that had been treated with a dormant oil application showed only an occasional insect. Both 3 and 6 per cent strengths of lubricating oil killed a majority of the eggs in the twigs and very few hoppers emerged. Three per cent coal gas tar oil appeared to have no influence on the eggs.

A count of eggs on twigs taken from an orchard that had been sprayed with a dormant application of 6 per cent lubricating oil gave the following figures. The counts were made 11 days after the normal hatch.

Total eggs counted	156
Number of eggs hatched	39
Number of eggs unhatched	117
Percentage eggs killed by oil	75%
Percentage eggs not killed	25%

—12-27-37.

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Cottonseed-Hull Bran in Grasshopper Bait

Experiments conducted at State College, Mississippi, in July indicate that cottonseed-hull bran is about as effective as wheat bran as a carrier for poison in grasshopper bait. At present this material is used chiefly for diluting cottonseed meal to cut down its analysis and the cost is very reasonable, being only one-fifth that of wheat bran.

Laboratory tests seemed to indicate that a mixture of three parts hull-bran to one part wheat bran was slightly more effective than the 100 per cent hull-bran but under field conditions there seemed to be little difference. This may be accounted for by the fact that the laboratory tests were conducted with *Melanoplus differentialis* (Thos.) while in the field tests *Schistocerca americana* (Drury) was used. The material was tested on a severe infestation of the latter species on the experiment station farm and furnished a good opportunity to compare the effectiveness of 100 per cent wheat bran, 100 per cent hull-bran, and various mixtures of the two. Future tests may indicate that it is advisable to use a mixture of hull-bran and wheat flour, about one

to ten, to prevent the rapid drying which is characteristic of the hull-bran bait. This might be especially desirable in a dry climate. The bait found most effective under field conditions at State College was one consisting of:

Hull-bran	100 lbs.
Sodium arsenite or Paris green	5 lbs.
Amyl acetate	4 oz.
Molasses	2 gal.
Water	7 gal.

It will be noted that this mixture requires slightly less water than the usual wheat bran mixture.—11-17-37

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Higher Ketones as Intermediary Solvents for Derris Resinate Used in Petroleum Spray Oil

Investigators have found the powdered root of *Derris elliptica* (Deguelia) and cubé root to be toxic to a number of insects. The compound most toxic to insects in the powdered root is rotenone. Derris resinate, which appears to be toxic to several insects when incorporated with certain solvents and used with citrus spray oils, is the material that is extractable from the powdered root when acetone, ethyl ether, or other solvents are used. The solvent is distilled off, leaving the resinate as a gummy mass.

In the summer of 1935 a study was made of the toxicity of the powdered derris root mixed with various organic solvents. It was believed that by making a paste of the derris powder before it was added to the oil, some of the rotenone and resins would be extracted, thus increasing the efficiency of the mixture. Several plots consisting of Washington Naval orange trees infested with black scale, *Saissetia oleae* (Bern.), were sprayed with various dosages of this material. The results were not satisfactory.

Acetone and ethyl ether derris extracts were also used with low percentages of spray oil, but certain difficulties were encountered such as the resins flocculating and going out of the oil phase into the aqueous phase.

During the winter of 1936-37 tests were made on a number of organic solvents from the standpoint of (1) the solubility of the derris resinate in the solvent; (2) the solubility of solvent in the spray oil; (3) the solubility or suspensibility of the derris resinate-solvent mixture in the spray oil; (4) the solubility of the solvent in water; and (5) the toxicity of the mixture to certain scale insects. The main groups of the solvents tested were: (1) alcohols, (2) alcohol-ethers, (3) ethers, (4) glycols, (5) aldehydes, (6) ketones, (7) esters, (8) aliphatic amines, (9) chlorinated products of the saturated hydrocarbons, (10) phenols, (11) benzene and benzene derivatives, and (12) the essential oils. Only a few compounds in each group were tested. The higher ketones appeared to give the best results from the standpoint of solubility of the derris resinate, stability of the resulting mixture, and added toxicity to the spray oil. Other compounds such as 2,2' dichlorethyl ether, sassafras oil, and the higher acetates appeared to be good solvents for derris resinate, and experimental data seem to indicate an added toxicity to the spray oil. California red scale, *Aonidiella aurantii* (Mask.), was used as the test animal.

Derris resinates is not very soluble in highly refined petroleum oil such as is used in the spraying of citrus. Thus, when an appreciable amount of the derris resinates-solvent mixture is added to the oil, a suspension of resins and rotenone is formed.

In the early part of 1937 laboratory experiments were made using methyl isobutyl ketone, methyl-n-amyl ketone, and 2,2' dichlorethyl ether as intermediary solvents for the derris resinates and tank mix spray oil. Lemons infested with California red scale were used for the experiments. Derris resinates dissolved in methyl-n-amyl ketone appeared to give the best kill of the three solvents. Ebeling* has shown that methyl-n-amyl ketone incorporated in spray oil increases the toxicity of the oil to the red scale. Further laboratory and field work by Ebeling during the summer and fall of 1937 also substantiates the above findings with regard to the toxicity of derris resinates to red scale. He also found that the methyl-n-amyl ketone-derris resinates solution increased the toxicity of the oil to the Florida red scale, *Aonidiella aonidium* (Linn.). The derris resinates-methyl-n-amyl-ketone-oil mixture has been tested on the citricola scale, *Coccus pseudomagnoliarum* (Kuw.), and black scale, *Saissetia oleae* (Bern.). The results indicate an added toxicity to the oil to both insects. A paste formed by the addition of methyl-n-amyl ketone or 2,2' dichlorethyl ether to the derris powder seemed to increase the efficiency of the material.

This is a preliminary note and additional work is being carried on with high ketones and other solvents for carrying derris resinates.—2-2-38.

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Methyl Iodide as a Fumigant

Of the many chemicals tried as fumigants in the past six months, methyl iodide seems to show the most promise. Methyl iodide, CH_3I , contains approximately 89 per cent iodine, is a colorless to brown liquid, has a boiling point of 42.5 degrees C. and a specific gravity of 2.285. It is slightly soluble in water, 1.4 grams per 100 cc. of water at 20 degrees C. and is soluble in all proportions in alcohol and ether.

The first tests with methyl iodide were tried in a 13 liter bell jar, and later in a 12½ cubic ft. fumatorium, and then in a 100 cubic ft. fumatorium. Tests have been carried on at exposures of 1 hour, 1½ hours, 3 hours, and 5 hours with a temperature of 76-80 degrees F. Large numbers of the following insects have been tried: resistant and non-resistant red scales, confused flour beetles, lady beetles, and codling moth larvae, as well as fewer numbers of other insects. A few tests conducted on citrus seedlings have shown that concentrations considerably above those which are lethal to the insects tried were not toxic to the plants.

The results in all cases indicate that this compound has possibilities as a fumigant. At the present time methyl iodide is very expensive, but if produced in large quantities, the price may be considerably reduced.—1-31-38.

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* Unpublished data, Dr. Walter Ebeling, Citrus Experiment Station, Riverside, California.

Bacteria Isolated from the Gut of Larval *Agriotes mancus* (Say)

In biological literature one finds references to the various types of bacteria found in the digestive tracts of insects and to the symbiotic relationships existing between micro-organisms and their hosts. From recent nutritional investigations one would conclude that bacteria furnish certain substances essential for the life processes of insects because little or no growth results from a diet of sterilized food unless the required accessory factors are supplied. This preliminary investigation was conducted in order to study the types of bacteria found in the gut of the wireworm.

Larvae of *Agriotes mancus* (Say) were collected from infested potatoes from the fields in the potato growing area of New York state. The larvae were made externally aseptic by using a sterilizing mixture of equal parts 1:1000 mercuric chloride and 80 per cent alcohol. Live wireworms were sterilized for 5 minutes in about 10 cc. of the sterilizing solution in a sterile Petri dish and were transferred to sterile distilled water for washing. The aseptic larvae were ground with sterile sand in a sterile mortar. The mixture of sand and larvae was transferred to a sterile water blank and various dilutions were plated on nutrient agar. The average count was approximately 550,000 bacteria per larvae. The greatest number of bacteria was found in the hind-gut. Many isolations were made and of these, 15 per cent were starch hydrolyzers and 75 per cent were proteolytic, as demonstrated by gelatin liquefaction. In all probability the larvae did not depend upon bacteria to aid in food assimilation.—1-19-38.

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Massing of Convergent Ladybeetle at Summits of Mountains in Southeastern United States*

The convergent ladybeetle, *Hippodamia convergens* Guer., is an abundant beneficial species in the southeastern states as well as in other parts of the country. It has long been on record that on the Pacific Coast it gathers gregariously in canyons and ravines in mountains for the winter.

In *Ecology* Vol. XVI No. 1, January, 1935, page 125, Alvin H. Throne of State Teachers College, Milwaukee, records finding this species at highest point on north range of the Porcupine Mountains, Ontonagon County, Michigan, on September 1, 1934: "millions clustered on bushes, etc." apparently gathered "preparatory to hibernation for the winter." The locality is in the western portion of the upper peninsula of Michigan, and those Mountains give the highest elevations in that state.

Several other species of ladybeetles are known to hibernate gregariously.

The purpose of these notes is to show that the convergent ladybeetle assembles in masses at summits of high mountain peaks (not ravines) in the southeastern states, and that this phenomenon apparently has no connection with hibernation. Our observations covering all seasons except spring, and reports of others, are recorded in table 1.

* No. 52 of Journal series, South Carolina Agricultural Experiment Station.

Table 1.—Massing of convergent ladybeetle at summits of high mountain peaks in southeastern United States.

PLACE	DATE	COMMENTS	OBSERVER
Pinnacle Mt. S. C., about 3,400 ft.	Aug. 3, 1926	Countless thousands clustered on weeds, bushes, among old leaves, etc. (details below)	F. Sherman, J. A. Berly, J. O. Pepper
Sassafras Mt., S. C., N. C. state line, about 3,500 ft., highest in vicinity	June 21, 1932		F. Sherman
Rabun Bald Mt., Ga., highest in vicinity	June 13, 1933	Masses found	F. Sherman
Mt. Pisgah, N. C., 5,749 ft., highest in vicinity	Aug. 21, 1932	Great masses seen	D. L. Wray
Mt. Pisgah, N. C., 5,749 ft., highest in vicinity	(date not recorded)	Great numbers presumably this species	Reported to F. S. by a visitor, name not taken.
Paris Mt., near Greenville, S. C., highest in vicinity	Feb. 3, 1933	Masses seen	Henry K. Townes
Mt. Sterling, Haywood County, N. C., one of highest in vicinity	(date not taken)	Great numbers seen, presumably this species	Reported to F. S. by attendant at meeting S. C. Academy of Science, Apr. 21, 1934.
Kings Mt. National Military Park, S. C., highest in vicinity	July 18, 1934	Masses seen at very summit	J. A. Berly
Mt. Mitchell, N. C., 6,711 ft., highest in eastern U. S.	Aug. 10, 1934	Masses observed	J. S. Holmes, State Forester of N. C.

The foregoing includes South Carolina, Georgia, North Carolina, and the Mount Sterling record perhaps touches Tennessee.

Returning now to Sassafras Mountain (Pickens Co., S. C.—Transylvania Co., N. C.) the highest point in South Carolina. The writer has there seen masses of this species many times, as now shown:—

Sassafras Mt., S. C., N. C. state line, about 3,500 ft., highest in vicinity	June 21, 1932	Masses; some in flight, but movement almost nil in assembled masses.	
Sassafras Mt., S. C., N. C. state line, about 3,500 ft., highest in vicinity	July 30, 1932	Masses; search at bottom and under masses did not reveal dead ones nor remains.	
Sassafras Mt., S. C., N. C. state line, about 3,500 ft., highest in vicinity	Aug. 9, 1932	Masses; D. Dunavan and O. L. Cartwright made several photographs.	
Sassafras Mt., S. C., N. C. state line, about 3,500 ft., highest in vicinity	Aug. 24–25, 1932	Masses; 20 hours repeated observations as detailed in text.	
Sassafras Mt., S. C., N. C. state line, about 3,500 ft., highest in vicinity	Oct. 12, 1932	Masses present, but seemed diminished.	
Sassafras Mt., S. C., N. C. state line, about 3,500 ft., highest in vicinity	Jan. 20, 1933	Some clearing away of growth has been done on summit; several inches snow a month ago; masses present but scattered, in grass tufts close to ground.	
	(Did not find masses on visits May 31 and June 1)		
Sassafras Mt., S. C., N. C. state line, about 3,500 ft., highest in vicinity	June 21, 1933	Masses present; notes say that from flight activity I suspected they were assembling. (Apparently more arriving than departing.)	
	(Did not find masses on Oct. 6; no dead ones found where masses were previously)		
Sassafras Mt., S. C., N. C. state line, about 3,500 ft., highest in vicinity	July 31, 1934	Masses present, notes say:—"in greater numbers than I have before seen on this mountain."	
Sassafras Mt., S. C., N. C. state line, about 3,500 ft., highest in vicinity	Sept. 4, 1934	Masses present; (notes):—"perhaps the aggregations more scattered than last time; I estimate a gross total of a bushel or more."	
Sassafras Mt., S. C., N. C. state line, about 3,500 ft., highest in vicinity	June 19, 1937	Much more clearing has been done—one mass of perhaps two quarts of the beetles found.	

On August 24, 1932, the writer went to top of Sassafras Mountain (S. C.—N. C. state line) with Messrs. D. Dunavan and O. L. Cartwright of the Clemson College entomology staff, arriving about 4 P.M. Remained until 1 P.M. next day, making frequent observations with lantern and flashlight until midnight, and resumed observations at about

6 A.M. The masses of lady beetles were quiescent as heretofore, and throughout the time of our visit no general activity was observed:—masses exposed to sunshine became more active while the sun shone on them, some would fly away and others would arrive, yet as a whole the masses showed little movement. At times one might see several beetles in flight

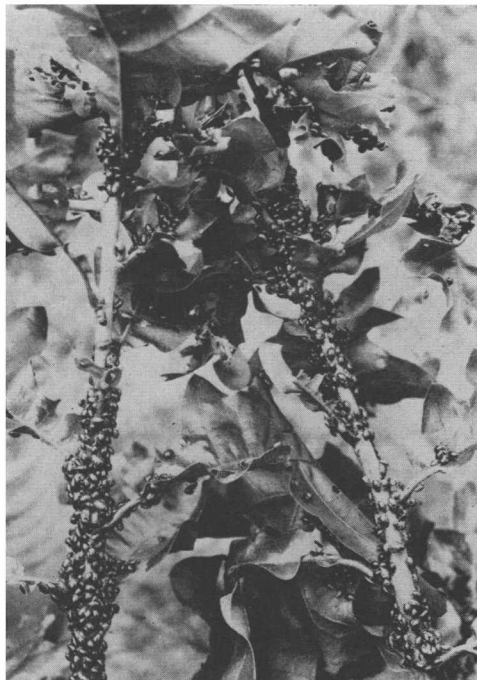


FIG. 1.—Massing of convergent ladybeetle on green oak sprouts two to three feet above ground. Others at base and on ground below. Summit of Sassafras Mountain, along South Carolina-North Carolina line, August 9, 1932.

at one time, but nothing like the swarming of bees, nor even like the usual flights before a hive. As night approached and all through the night the clusters of beetles remained as they were, those in exposed situations remaining exposed and those in sheltered situations remaining sheltered. There was less of crawling and flying as the sun went down, through evening, and night. In general there appeared to be more activity than on July 30 (a previous visit) but I watched them over a longer time and the sunshine was if anything brighter and warmer than on that date. No general movement by or among them, was yet in evidence.

In pondering as to the reason for these assemblages of *H. convergens* the following ideas occur:

1. *Hibernation*: That this has anything to do with it seems denied by finding these masses already assembled from June 19 to August 25 though early and middle summer, months before cold weather. Also many were not especially hidden away under shelter, nor did they seem to seek it.

2. *Aestivation*: This seems denied by having found the assembled masses on September 4, October 12 and January 20. Also many in these masses quietly remain exposed in the sunlight with no attempt to seek shade or other shelter.

3. *Food*: On no occasion have we found aphids or other natural food present or near in unusual abundance, nor evidence of such having been present. Also we have seen no evidence of hunger-urge. Instead of scattering and searching, their desire seems to be to assemble and remain quiet.

4. *Mating*: No abnormal amount of copulation-activity has been observed. If anything, there seems to be less than we would expect among so many.

5. *Spent, assembled to die*: Careful search has revealed surprisingly few (almost none) dead ones or remains in spots where gallons of them had been assembled on our previous visits, nor did we find dead or dying ones among or under the assembled masses.

Thus each of the possible explanations which would first come to mind seems denied by the observed facts. And the writer has no adequate explanation.

It seems worthy of repetition that these assemblages have not been in ravines or specially sheltered situations. They have been on the highest summits in the respective localities, on the lower portions of such low growth as may be there, as well as in base of grass-tufts, under old leaves on the ground and the like. On low oak sprouts for example, they may be massed (in summer) from the base up to and upon the growing green leaves as much as three feet above the ground, often several deep, newcomers crawling over those already assembled as shown in fig. 1—2-19-38.

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Organic Compounds Highly Toxic to Codling Moth Larvae

The Division of Insecticide Investigations of the Bureau of Entomology and Plant Quarantine has been engaged since 1932 in seeking substitutes for the arsenicals, more especially lead arsenate. In the course of this work several hundred organic compounds have been prepared and tested. A detailed report covering all compounds tested by the writers up to July 1, 1936, will be published separately. Those compounds found most toxic to codling moth larvae are reported at this time in the hope that entomologists will be encouraged to test them upon other insects of economic importance.

All tests reported in this paper were made by the apple-plug method (Sieglar & Munger 1933; Sieglar, Munger & Gahan 1934).

A great majority of the organic compounds tested were difficult to wet in water and therefore did not give uniform suspensions. In an attempt to improve this condition, various wetting agents, such as bentonite and ethyl alcohol, were employed.

Of the compounds tested, those listed in table 1 gave over 50 per cent of fruit free from worms.

It should be borne in mind that the relative ratios of stung and wormy fruit in these experiments varied greatly with the different compounds reported.

Of over 200 organic compounds tested, only the 20 listed gave more than 50 per cent of fruit free from worms. One compound, 3,5-dinitro-*o*-cresol, has been found toxic to codling moth larvae by other investigators. It is interesting, however, to note that by replacing the phenolic hydrogen in this compound by either an acetyl or a methyl group the resulting compound still shows high toxicity. Twelve of the toxic compounds contain nitrogen, in one of which (namely, 1-phenylbenzoxazole) the nitrogen is in a heterocyclic ring. Seven of the compounds contain sulfur. In four of these seven compounds the sulfur

Table 1.—Compounds tested which gave over 50 per cent of fruit free from worms:

COMPOUND	PERCENT OF FRUIT FREE FROM WORMS
3,5-dinitro- <i>o</i> -cresol	100.0
<i>p</i> -iodonitrobenzene	100.0
2-thiocoumarin (average 2 tests)	97.2
phenothioxin (average 3 tests)	93.5
1-phenylbenzoxazole	92.0
3,5-dinitro- <i>o</i> -cresol acetate	90.5
<i>m</i> -iodonitrobenzene	83.3
2-methyl-4,6-dinitroanisole	75.3
dibenzothiophene	73.6
<i>p</i> -bromobiphenyl	72.7
<i>p</i> -bromonitrobenzene	72.7
pentachlorophenol	68.6
thioxanthrydrol	66.0
<i>m</i> -dinitrobenzene	60.8
<i>p</i> -nitrosodimethylaniline	60.0
diphenyldisulfide	59.0
thioxanthone	59.3
1-nitroso-2-naphthol	57.8
acetone semicarbazone	54.3
thiocarbamide	52.7

is in a heterocyclic ring. There are six compounds containing a heterocyclic nucleus and five that are halogenated. These studies fail to show any simple relationship between the constitution of organic compounds and their toxicity to insects.—12-17-37.

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- Siegler, E. H. and F. Munger. 1933. A field and laboratory technique for toxicological studies of the codling moth. *JOUR. ECON. ENT.* 26(2): 438-45. Illus. Apr.
- Siegler, E. H., F. Munger and J. B. Gahan. 1934. Improvement in apple plug technique for toxicological studies of the codling moth. *JOUR. ECON. ENT.* 27(6):1140-2. Illus. Dec.

Synonymy of the *Eusepes* Sweetpotato Weevil (Coleoptera, Curculionidae)

Because my paper "Cryptorhynchinae of the Society Islands" is in a publication infrequently seen and rarely referred to by economic entomologists, I believe it worthwhile to reconsider in this journal my nomenclatorial findings concerning *Eusepes batatae* (Waterhouse), commonly called the West Indian sweetpotato weevil.

Unfortunately, it has been found necessary to

change the name of the common, widespread, cryptorhynchine weevil pest of sweetpotato, *Eusepes batatae* (Waterhouse). This species has been incorrectly masquerading as a "lost species" under the name *Cryptorhynchus postfasciatus* Fairmaire. Fairmaire described the species in 1849 from a unique specimen collected on Tahiti in the Society Islands.

While working over the material I collected during the course of the Mangarevan Expedition to southeastern Polynesia in 1934, I found that Fairmaire's species was identical with the sweetpotato weevil. Furthermore, it was found that Fairmaire's name antedates that of Waterhouse, necessitating additional synonymy. Unless it is shown in the future that there is an older name, this sweetpotato weevil shall be known as follows:

Eusepes postfasciatus (Fairmaire) Zimmerman:
B. P. Bishop Mus. Occ. Papers, vol. 12, no. 23,
p. 14, 1936.

Cryptorhynchus postfasciatus Fairmaire: *Rev. Mag. Zool.*, p. 513, 1849 (in reprint, p. 65, June 1849).

Cryptorhynchus batatae Waterhouse: *Proc. Ent. Soc. London*, p. lxxix, 1849 (printed 1850).

Hyperomorpha squamosa Blackburn: *Trans. Roy. Soc. London*, ser. 2, vol. 3, pp. 182-183, 1885.

Eusepes batatae (Waterhouse) Champion: *Biol. Centr. Amer.*, Coleoptera, vol. 4, pt. 4, p. 497. 1905.—12-27-37.

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Distribution of Elm Bark Beetles in Massachusetts

A survey of the distribution of smaller European elm bark beetles in Massachusetts, conducted by the State Dutch Elm Disease Laboratory at Amherst during the summers of 1935, 1936 and 1937 showed *Scolytus multistriatus* Marsham to be present in the following towns. WESTERN MASSACHUSETTS: Great Barrington and New Marlborough. EASTERN MASSACHUSETTS: Merrimac, Haverhill, Methuen, Tyngsborough, Tewksbury, Andover, North Andover, Boxford, Georgetown, Topsfield, Wenham, Beverly, Danvers, Billerica, Reading, Woburn, Stoneham, Saugus, Revere, Winthrop, Lexington, Sudbury, Weston, Waltham, Belmont, Newton, Brookline, Boston, Wellesley, Natick, Dover, Westwood, Walpole, Canton, Easton, Abington, Rockland, Brockton, Marshfield, Bridgewater, East Bridgewater, Halifax and Plymouth. These findings do not include those previously reported by this office [W. B. Becker, *JOUR. ECON. ENT.*, 28(5): 833].

Hylurgopinus rufipes (Eich.) was found to be distributed in every section of the state scouted. The only sections not scouted were Cape Cod and the islands off the coast.—12-1-37.

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