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TWO NEW THYSANOPTERA FROM MEXICO

J. R. WATSON

Heterothrips cuernavacae n. sp.

MACROPTEROUS FEMALE:—General body color brown. Head, prothorax, femora and tibiae and most of antennae and sides of abdominal segments 8-10 darkest, raw amber (Ridgeway, Plate III).

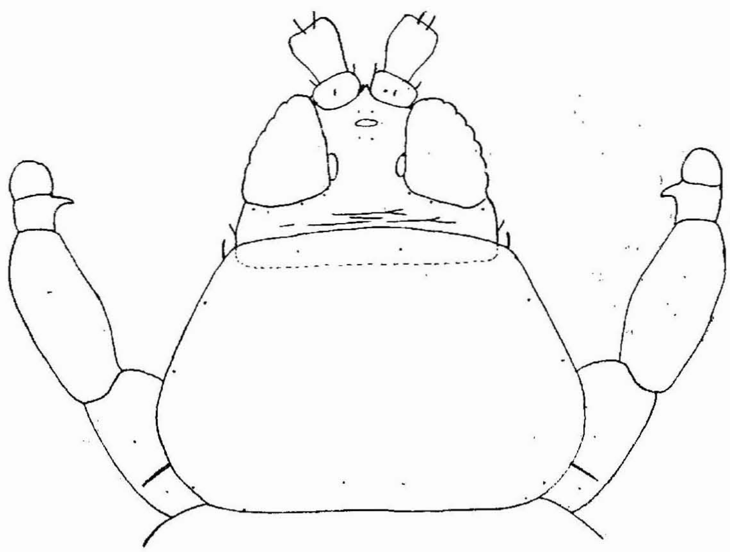

Fig. 1.—*Heterothrips cuernavacae* nov. sp. Head and prothorax ♀ holotype. (J. R. P. Del.)

Pterothorax lighter and suffused with orange hypodermal pigment, abdomen lighter still, segments 1 to 4 and 8 gray brown and suffused with yellow hypodermal pigment, segments 6 and 7 darker and lacking the hypodermal pigment so that the abdomen in the type and one paratype has a distinct banded appearance, segments 8 to 10 darker especially along the sides. In one paratype the abdomen is uniformly colored. Antennal segment III with yellow pedicel, gradually shading to brown toward apex, also apex of IV lighter. All tarsi yellow tipped with brown, fore tibiae tinted with yellow, especially along the inner margin; bases of middle and hind femora lighter.

Fore wings uniform light brown except a small, oval colorless area in basal fourth.

Head 1½ times as wide as long, widest behind the eyes. Cheeks strongly bulging behind the eyes, bearing two colorless spines about 12 microns long. Dorsum striated, two lines being especially heavy.

Eyes tapering to a point apically, subtriangular in outline, pilose, facets large.

Ocelli yellow, posterior pair opposite posterior third of eyes and contiguous with their margins, a series of three or four minute bristles near and close to the posterior margins of the eyes. Antennae 2½ times as long as head.

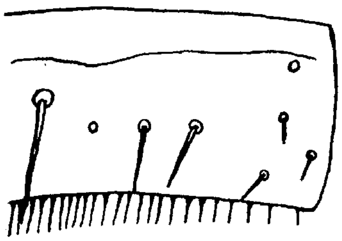

Fig. 2.—*Heterothrips cuernavacae.* Right half 7th abdominal tergite ♀ holotype. (Drawn by J. R. Preer.)

Prothorax about 1½ times as wide (including coxae) as long. Dorsal surface nearly smooth. A stout, brown spine at each posterior angle about 26 microns long. Pterothorax a trifle wider than prothorax. Metathorax with sides converging posteriorally.

Forewings with about 22 bristles on fore vein and 18 on hind and 23 on costal border. Fringe short on basal third but beyond that abruptly lengthened. Abdominal segments provided with three pairs of bristles on dorsal surface. These become progressively longer to the 7th or 8th segment, where the median pair, which are longest, project well beyond the border of the segments, but diminish in length and stoutness on 9th and 10th segments.

Posterior segments bordered by combs of hairs of approximately equal length whose bases are not at all coalesced into plates.

Measurements of type. Total body length 1.4 mm. Head, length .10 mm., width .15 mm., prothorax, length .16 mm., width .23 mm.; pterothorax, width .24 mm.; abdomen, width .28 mm. Antennae, total length .26 mm. Segments, length (width): I, 19(30); II, 33(24); III, 51(21); IV, 37(22); V, 28(21); VI, 29(19); VII, 23(13); VIII, 20(12); IX, 11(9) microns.

MALE:—Considerably smaller than female.

Color almost uniform brown, only tarsi; fore tibiae (except margins), base of antennal segment III, apex of IV and in some paratypes apex of II, brownish yellow. Pterothorax and abdomen somewhat lighter than head and prothorax. Testes dark brown. Hypodermal pigment of female largely absent.

Fore femora considerably enlarged, more than half as wide as long. Measurements of type. Total length .87 mm. Head, length .07 mm., width .21 mm.; pterothorax, width .22 mm., abdomen greatest width .14 mm. Antennae, total length .27 mm. Segment, length (width): I, 23(26); II, 30(24); III, 51(21); IV, 42(21); V, 33(18); VI, 33(17); VII, 26(12); VIII, 21(12); IX, 21(7) microns.

Length of paratypes varies from .84 mm. to .97 mm.; length of antennal segment II from 28 to 35 microns, III from 45 to 51, IV from 33 to 43, V from 23 to 33, VI from 26 to 35.

Described from three females and eight males collected from an unknown composite at Cuernavaca, Mexico, August 22, 1938. Type in author's collection. Paratypes in U. S. National Museum.

***Arpediothrips mexicanus* n. sp.**

MICROPTEROUS FEMALE:—Length about 1 mm. Body almost uniformly light brown (clay color—Ridgeway Pl. XXIX). Fore tibiae, distal half of middle and hind tibiae, all tarsi and antennal segments 3-5 lighter. Head appreciably wider than long; widest across the cheeks. Cheeks arched, narrowing to base of the slightly bulging eyes and to the base of the mouth cone. Vertex finely but *distinctly striated.* Postocular bristles distinct, about 11 microns long. Ocelli pale but bordered by bright red crescents, widely separated, posterior pair situated posterior to the middle of eyes and close to their margins but not touching; anterior well back of apex.

Mouth cone long, reaching the mesosternum.

Eyes dark red, rather coarsely faceted.

Prothorax wider than long, sides almost straight and parallel. The long spines at posterior angles about 23 microns long. Those at anterior angles and the others at posterior angles minute.

Mesothorax considerably wider than prothorax, sides sharply arched. Metathorax narrower with sides straight but converging posteriorly. Wings very short, not reaching the second abdominal segment. Abdomen thick and heavy. Posterior angles of the posterior segments carry *conspicuous brown bristles.* Those of segment 8 almost *thorn-like,* 29 microns long. Those on segment 9 also heavy, 56 microns long. Terminal bristles 58 microns.

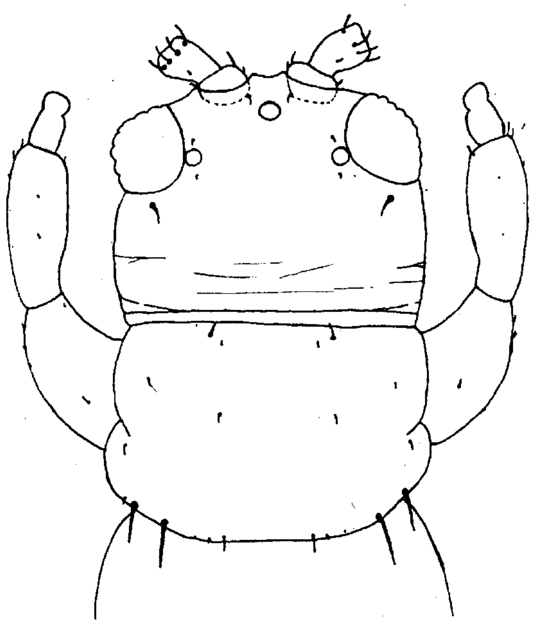

Fig. 3.—*Arpediothrips mexicanus* nov. sp.
Head and prothorax holotype. (J. R. P. Del.)

Measurements of type female: Body length 1.02 mm. Head, length .14 mm., greatest width .17 mm. Prothorax, length .12 mm., greatest width (including coxae) .17 mm. Mesothorax, greatest width (near middle) .21 mm. Metathorax, greatest width (at base) .19 mm. Abdomen greatest width .26 mm. Antennae, total length .25 mm. Segments, length (width): I, 21(29); II, 36(26); III, 41(20); IV, 42(16); V, 37(16); VI, 47(16); VII, 9(7); VIII, 12(5) microns.

Some of the paratypes vary somewhat widely from these measurements given above. Total length varies from .9 mm. to 1.14 mm. Head length in one is only .12 mm. Prothorax length varies from .09 mm. to .14 mm. Length of antennal segment I from 12 to 23 microns. II is only 31 microns long in one; IV varies from 31 to 42 microns; VI from 42 to 60 microns. In all, the head is wider than the prothorax.

MALE (Micropterous):—Somewhat lighter in color than the female. Testacles deep brown. Smaller, the paratype only .816 mm. long.

Measurements (of type): Total body length .97 mm. Head, length .12 mm., width .15 mm.; prothorax, length .103 mm., width .15 mm.; mesothorax, length .19 mm.; metathorax, length .17 mm. Abdomen, width .18 mm. Antennae .234 mm. Segments, length (width): I, 19(28); II, 30(23); III, 41(16); IV, 35(14); V, 35(14); VI, 44(16); VII, 7(12); VIII, 12(5) microns.

In the paratype III is 44 microns long and VI only 33.

Described from eleven females and two males taken from under the leaf sheaths of a Yucca in the state of Neuvo Leon, Mexico, north of Monterey on August 7, 1938.

These have been compared with paratypes of the type species *A. mojave* Hood from California. This species is much darker in color, a more sturdy insect (*mojave* is slender); head proportionally narrower, and the prothorax much narrower. The bristles much more sturdy and darker, especially those on the posterior abdominal segments.

ARTHUR P. JACOT

We are advised, just as we go to press, of the death on March 24th at New Haven, Connecticut, of Arthur P. Jacot. Readers of the FLORIDA ENTOMOLOGIST will recall numerous articles of his on beetle mites which have been published in our journal over a period of several years. These articles included descriptions of numerous new species or varieties as well as many notes on the taxonomy and distribution of species already described. Most of these were collected by entomologists of the Experiment Station, especially the late Edgar Grossman, although Mr. Jacot himself made one trip to Florida where he made firm friends of all of us. His untimely death is a great shock. We hope in an early number of the ENTOMOLOGIST to be able to give a more extended account of his life and work.

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THE PHYSIOLOGICAL EFFECTS OF MINERAL OILS ON CITRUS[1]

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INTRODUCTION

In the use of any spray material for control of plant pests the deleterious effects of such materials on the plant itself must be recognized. The studies along this avenue of research were conducted during an investigation leading to the manufacture of an oil emulsion for citrus use. It is through the courtesy of the Haines City Citrus Growers Association, for whom the work was done, that the presentation of this paper is made possible.

The percentage of actual oil used in these experiments was necessarily held at a high level in order to properly evaluate the differences in physiological effects. Deficiencies in soil moisture during the period under discussion have probably also accentuated the results. It should be noted here that no damage has resulted from the widespread use of emulsions similar to those of Experiment No. 2 at concentrations of from 1% to 1.3% actual oil during the summer months of 1938.

TYPES OF OIL DAMAGE

Primary Physiological Effects

Emulsions of the heavier distillates have been in use since the turn of the century. Since that time the literature on the

[1]Paper read before the December 1938 meeting of the Fla. Ent. Soc.

subject of damage resulting from the use of the oil emulsion has become extensive. The following references cannot be considered complete, but only as showing the trend of the work.

Volck (1)[2] and Knight, Chamberlin and Samuels (2) have shown that oil penetration is greatest in those areas where stomata are located but not necessarily confined to those areas. Knight and Cleveland (3) have reported that the amount of penetration is associated with the angle of contact, which accounts for the greater penetration on old foliage, especially where the cutin has been destroyed by insects, abrasions or ordinary wear and tear.

Yothers (4) has recorded the drop of large percentages of old leaves starting about three days following oil treatment. Other types of damage were noted in lesser degrees. Gray and DeOng (5) have tabulated the "chronic" injuries to citrus due to applications of heavy oils which leave oil films on leaves or twigs for days or weeks. Twigs and even larger limbs are stunted or killed. Fully matured leaves, especially if senile, are more susceptible to injury from neutral oils, while young leaves are more susceptible to injury from oils of lower sulphonation.

DeOng, Knight and Chamberlin (6) have shown that oils of from 51% to 60% sulphonation resulted in heavier defoliation and twig death than did neutral white oils of 98% sulphonation. They have also called attention to the temperature factor. DeOng (7) has further suggested that apparently the 1st or 2nd treatment with sulfuric acid or sulfur dioxide removes the parts dangerous to plants and insects. Smith (8) has shown that the amount of leaf drop following oil applications to citrus is correlated with the amount of oil deposited, and increases with higher viscosities and lower sulphonations. DeOng, Knight and Chamberlin (6) have described the characteristic effects following the use of neutral white oils as: more or less heavy leaf drop principally of senile or semi-senile leaves; drop of tree-ripe fruit; inhibition of normal color in lemons; drop of green Valencia oranges during humid weather and retardation of ripening.

Magness and Burroughs (9) have found that an oil film on the surface of stored apples may have a distinct effect on gaseous exchange. The evolution of carbon dioxide to oxygen was reduced, but analysis of the air in the inner cellular spaces

[2]Refers to literature cited on page 28.

showed an increase in the ratio of carbon dioxide to oxygen. Burroughs (10) has noted a reduction in the amount of starch produced in apple leaves that seem to have been arrested in their growth by an application of an oil spray.

Kelley (11) has found that both saturated and unsaturated oils retarded transpiration on deciduous fruits, when applied to the lower leaf surfaces where the stomata are located.

Secondary Physiological Effects

Shamel and Pomeroy (12) have shown a correlation between number of leaves on Valencia trees and the fruit sizes. In other papers: Shamel, Pomeroy and Care (13) and Shamel and Pomeroy (14) have shown similar relationships in Navel oranges and Marsh grapefruit. Magness, Overley and Luce (15) have shown correlations between leaf area and size of crop on apples and pears.

Spuler, Overley and Green (16) have stated that oil sprays, particularly those of high viscosity, cause metabolic disturbances in the foliage (of apples) which is reflected in decreased size and color of fruit. The extent to which these disturbances decrease the size and color of fruit is dependent on the load of fruit on the trees, the soil moisture and the variety of fruit.

Fudge (17) has shown that while magnesium deficiencies "bronze" foliage of grapefruit and cause excessive defoliation under heavy cropping, the succeeding alternation of bearing results, not because of a magnesium deficiency, but principally because of a limited and inefficient leaf area.

EXPERIMENT NO. 1

A tank mix application was made on February 25th to Valencia trees, using an oil of 70 seconds viscosity and 83% U. R. at a concentration of 1⅔% actual oil. Application was thorough, inside and outside, with use of two nozzle guns. This tank mix depended chiefly on the agitation of the paddles for stability. Such agitation was found to be slightly deficient with the result that the last portion left in the spray tank contained a higher percentage of actual oil than did the first portion. Therefore the first group of trees (nine) received a lesser percentage of oil than did the last group (five).

There was general growth of a good green color, averaging five inches in length at the time of application. Bloom was heavy with some fruit set, some blossoms open and some unopened blossom buds. A 33° F. temperature was recorded the night following the application with minimum temperatures from 46° to 64° during the following week (maximums 76° to 84°).

Primary Oil Damage Symptoms

General shadowing of both old and new foliage occurred, with marginal burn of a slight degree appearing on new foliage after several days. The distal portions of the petals of the unopened bloom spread apart to allow the pistil to protrude and brown spots appeared on the outer surface of the petals. Despite these abnormalities, the blossoms opened normally. There was some drop of mature leaves, being greatest in the second group of trees but no counts were made. At the end of 10 days 39% of the young set fruit on the treated trees was yellow in color or shed; while only 18.3% showed these conditions on the untreated trees.

The most outstanding effect of this application was the drop of tree-ripe fruit of the 1937 crop. On April 22nd (56 days after application) a count of all fruit on the ground showed an average of 52.6 for the sprayed trees against 5.4 for the untreated. This drop was greatest in the second group of treated trees (Table No. 1).

Fruit crops were recorded as the number of fruit which could be observed from the ground to a six-foot level while slowly walking around the trees. This has proven to be a very reliable comparative criterion. The average of two counts (April 22nd and September 3rd) revealed 51.4 fruit per treated tree as against 76.7 per untreated tree. This decrease in fruit crop is correlated with the percentage of young set fruit paled or dropped by the oil application and is considered a direct effect of the application.

Secondary Physiological Effects

On September 3rd the treated fruit averaged 6.65 cm. in diameter while the untreated averaged 6.7 cm. From the work of Shamel and Pomeroy (12) the fruit on the treated trees would be expected to be smaller in size than those on the untreated trees due to loss of foliage resulting from oil application. That this did not occur is considered to be due to the fact that the oil also dropped a percentage of the fruit crop and probably in proportion to leaf drop; the leaf-fruit ratio remaining undisturbed.

June growth appeared more rapidly on the treated trees. On June 1st 21.75% of the spring growth terminals on the treated trees showed burst buds, while only 7.2% showed the same condition on the untreated.

Due to dry conditions during the spring of this year (1938) there was an exceedingly heavy June bloom. On September 3rd there was an average of 18.9 June bloom fruit on the treated trees as against 26.8 on the untreated.

EXPERIMENT NO. 2

On May 12th adjacent Valencia trees were treated with an oil of 70 seconds viscosity and 83% U. R. at 1⅔% concentration and emulsified with succeedingly larger amounts of the same material in the proportions of 1, 2 and 4. Thus the actual deposit of oil on the tree surfaces was succeedingly decreased. The spray was applied by the author as a thorough outside coverage and a similar inside coverage as afforded by the force of 500 pounds pressure, with the use of a 6-nozzle gun. Minimum temperatures during the week following application varied from 57° to 72° F. (Max. 87-94°.)

At the time of the application the fruit averaged 3.7 cm. in diameter with slight variations between trees. All trees were in a thrifty condition, spring growth hardening and no wilt in spite of lack of rain. The crop varied as follows: Tree No. 1, light, 20 fruit; No. 2, medium, 70 fruit; No. 3, heavy, 195 fruit; No. 4, light, 29 fruit; No. 5, light, 15 fruit; and No. 5-II, heavy.

Trees Nos. 1, 5 and 5-II received no oil. Tree No. 2 received an emulsion containing 23 cc. emulsifier per gallon; No. 3 one containing 46 cc.; and No. 4 one containing 92 cc.

Symptoms of Oil Damage

The mature leaves of the 1937 fall flush began to drop 24 hours after treatment and continued a little over one-half month. This drop was recorded by counting the number of leaves on the ground from the "drip" of the tree outward to the square of the tree at two to three day intervals. The average drop for the untreated trees was 104.5; while for the treated trees it was 543. This drop was in approximate proportion to the tree size and not in relation to amount of emulsifier (Table No. 2). The heavy drop of mature leaves would be expected as shown by the work of Knight and Cleveland (3) which indicates that oil penetration is greatest on old foliage and that this penetration cannot be controlled to any great extent. It should be considered that the deposit of oil was heavy in all cases and probably exceeded the minimum requirements necessary for mature leaf drop in even the most "tight" formula used.

Drop of spring fruit began a few days after treatment and continued for about a month (Table No. 2). As the amount of emulsifier was increased, the droppage was decreased.

Drop of spring foliage was tabulated by counting the number of leaves on 50 spring growth terminals and the number of fresh leaf scars indicating dropped leaves. Two counts were averaged (May 17 and June 1), showing a decreasing amount of droppage as the emulsifier was increased (Table No. 2).

All sprayed trees showed very definite shadowing of leaves and fruit. On the day following the application 99% of the spring leaves and 100% of the spring fruit showed shadow. This shadow appeared to be slightly more continuous with the lower amounts of emulsifier. No shadow was evident on the untreated trees. Even 141 days later, on September 30th, a few fruit on the treated trees showed slight shadowing.

There was no burn evident on foliage and only one fruit (on Tree No. 3) showed burn.

Secondary Physiological Effects

As noted above, Shamel and Pomeroy (12), Magness, Overley and Luce (15), Fudge (17), any condition which drops large percentages of foliage will have a resultant effect on the physiological balance of the tree. Since the droppage of foliage of 1937 fall growth was more nearly correlated to the size of the trees and number of leaves present, it would be presumed that secondary physiological effects would be nearly constant for all treated trees. This apparently is the case.

The untreated trees showed an average fruit diameter on August 27th of 6.69 cm., while the treated trees averaged 6.1 cm. The fruit size was inversely proportional to size of crop (Table No. 4). The variations between sizes on the treated trees were constant with the variations between sizes on the untreated. Thus, the ratio between 5-II and 5 (untreated) is similar to that between 3 and 4 (treated).

On the first of June counts of 50 spring growth terminals showed an average of 25% with burst buds on untreated trees; while the average was 70% on the treated trees, with no significant difference between trees (Table No. 3).

The June bloom crop averaged 3.3 fruit for the treated trees, with 33 fruit for the untreated (Table No. 4).

SUMMARY

Applications of high concentrations of mineral oils exert a direct effect on Valencia trees. This effect is most pronounced in the droppage of tree-ripe fruit and mature leaves due to their lowered surface tension allowing for greater penetration of oil.

Drop of immature leaves and fruit was in no case as heavy as that of mature leaves and fruit. The surface tension is higher on these parts and the resistance to penetration greater. On such surfaces the minimum amount of oil required for abscission is greater. The effect of varying amounts of oil deposition as influenced by the emulsifier would, therefore, be more marked. This has been shown.

Secondary Physiological Effects

The loss of large numbers of leaves following these heavy applications of oil resulted in three definite physiological responses. The size of immature fruit was retarded, except where the reduction of crop was approximately proportional to reduction in leaf area. The number of fruit borne in the succeeding crop was reduced. The subsequent flush of growth was accelerated. A fourth condition, killing of wood, is sometimes brought about either directly due to oil penetration or as a secondary effect should new growth fail to appear after drop of leaves. In the latter case, sap exchange is interrupted which results in the collapse of the wood cells.

CONCLUSIONS

The value of oil applications for the control of scale pests is well-established. The damages outlined in this paper were brought about by applications of oil of high concentrations at periods of the year which are normally considered untimely for such applications. On the other hand, the same types of emulsions were used throughout the year on hundreds of acres of groves under commercial conditions without damage and with excellent scale control.

The insecticidal and phytocidal properties of mineral oils are closely correlated. Therefore emulsions of these oils must be so timed in their applications to allow maximum deposit without detrimental plant reaction and minimum deposit for thorough pest control. Emulsifying an oil in such a manner as to reduce the oil deposit upon application to the plant does not answer the question.

The premature droppage of foliage, from any cause whatsoever, must be regarded as a detrimental factor in commercial fruit production. Fruit production is the function of foliage. Acceleration in appearance of a growth flush when due to decreased or inefficient foliage conditions signifies a return of the plant to a vegetative state; a physiological response toward maintaining equilibrium of value to the commercial orchardist only when the motivating force has been unavoidable.

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TABLE NO. 1—EXPERIMENT NO. 1—COMPARISON OF TREATED AND UNTREATED TREES.

Date Checked 1938	Condition	Treated Trees All Trees	First Nine	Last Five	Untreated Trees
2/26	Leaf Shadow	Present	Present	Present	Absent
2/28	Marginal burn on young foliage	Slight	Slight	Slight	None
	Young set of fruit pale in color	58.0%			36.0%
3/7	Young set fruit light in color or dropped	39.0%			18.3%
4/22	Average drop of tree-ripe fruit (per tree)	52.6	33.4	87.2	5.4
	Average number of 1938 spring fruit per tree (ground to six-foot level)	47.6	57.6	29.8	65.3
6/1	Average percentage of spring growth terminals showing burst buds of June flush	21.75			7.2
9/3	Average number of 1938 spring fruit per tree (ground to six-foot level)	55.1	65.8	35.8	88.1
	Average size of 1938 spring fruit in diameter	6.65 cm.			6.7 cm.
	Average number of 1938 June fruit per tree (ground to six-foot level)	18.9	24.9	8.0	26.8

TABLE NO. 2—EXPERIMENT NO. 2—DROP OF LEAVES AND FRUIT FOLLOWING OIL APPLICATION.

Tree No.	Amount Emulsifier	Mature Leaves (number)	Spring Foliage %	Spring Fruit Number	Spring Fruit Percentage*
1	Check	46	4.43	0	0.0
2	23 cc.	373	7.23	31	44.3
3	46 cc.	456	4.46	47	24.1
4	92 cc.	800	3.99	5	17.2
5	Check	163	2.01	2	13.3

*Based on crop from ground to six-foot level.

TABLE NO. 3—EXPERIMENT NO. 2—PERCENTAGE OF SPRING TERMINALS SHOWING BURST BUDS OF JUNE GROWTH JUNE 1, 1938.

Tree No.	Amount Emulsifier	Percentage
1	Check	38.0
2	23 cc.	72.0
3	46 cc.	66.0
4	92 cc.	72.0
5	Check	12.0

TABLE NO. 4—EXPERIMENT NO. 2—CROPPING.

Tree No.	Amount Emulsifier	Size of Crops			Average Size Spring Fruit
		Spring Crop		June Crop	
		5/12/38	8/27/38	8/27/38	8/27/38
1	Check	20	31	37	6.78
2	23 cc.	70	76	1	6.19
3	46 cc.	195	215	8	5.97
4	92 cc.	29	31	1	6.13
5	Check	15	27	17	6.75
5-II*	Check	—	161	45	6.53

*5-II Check is a further untreated tree which had a heavy crop of fruit and which was counted for cropping conditions to show comparison with No. 3 treated tree which also had a heavy crop.

SOME ECOLOGICAL NOTES ON THE LUBBERLY LOCUST—*Romalea micropter* Beauv.[1]

By J. R. WATSON and H. E. BRATLEY

The lubberly locust, though generally distributed over Florida and other southeastern states, has for several years been particularly troublesome in the vicinity of farms where narcissus was being grown. Complaints from farmers in these regions induced the writers to undertake a study of the relationship between this insect and the bulb farms. Large numbers of adults were imprisoned in cages in Gainesville in June, 1938, fed liberally and allowed to lay eggs in the soil. Egg-laying in these cages was concluded in early August. The first young hoppers appeared on March 14, 1939. The same week the first nymphs were observed in a bulb farm at Penney Farms. For the first few hours after hatching the nymphs are of a reddish brown color so that newly hatched ones are easily identified. They remain in colonies close to the egg mass from which they hatched for several days, which makes them still more conspicuous and enables one to determine the place of oviposition. It was found that they were not coming from the bulb fields nor any field which was plowed or cultivated after June. They were hatching on ditch banks, roadsides and in a field which was planted to early corn in 1938 but not cultivated after June. They were very abundant in a cleared field which had never been plowed but had a loose, sandy, well drained soil. On the other hand none were observed in the more compact soils of the undisturbed "flat woods" or pinelands.

A most remarkable migration from these situations into the narcissus fields was observed. The nymphs moved in columns from adjoining fields in some cases five or six hundred feet away, straight towards the narcissus. On March 24th fifteen of these columns of migrating nymphs were observed in two-tenths of a mile, crossing an asphalt road. They were moving against the wind.

[1]Contribution from the Department of Entomology, Florida Agricultural Experiment Station.