

TABLE IV. AMOUNT OF POLYSULFIDS IN LIME SULFUR TREATED AND UNTREATED COMBINATION SPRAY

	After 3 hrs.	After 2 days
Lime sulfur only.....	4.360 gms.	4.360 gms.
Lime sulfur and lead arsenate.....	1.892 "	None
Lime sulfur and lead arsenate and lime.....	4.240 "	3.040 "

Here again the value of adding lime to lime sulfur previous to combining with lead hydrogen arsenate is emphasized. The polysulfid content of the combination spray that had been treated with lime had decreased only a negligible amount while the untreated showed a loss of almost 50 per cent of its fungicidal and insecticidal properties.

Attention is further called to chemical changes that had continued during two days: Where lime had been previously added to the combination spray over 75 per cent of the lime sulfur remained unchanged and as efficient as ever for spraying purposes. Where no lime had been added all polysulfid sulfur had been transformed into sulfid of lead or to thiosulfate. In this form the spray is practically valueless as its peculiar properties are destroyed.

CONCLUSIONS

The data herein reported indicate that there is a pronounced detrimental chemical reaction between lime sulfur and lead hydrogen arsenate when mixed for a combination spray.

The addition of lime at the rate of about ten pounds to 100 gallons of lime sulfur, previous to adding the lead arsenate, prevents to a certain extent this reaction.

THE HOUGHTON GOOSEBERRY APHIS

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In 1906 James Troop¹ described under the name of *Aphis houghtonensis* a species of aphid injurious to gooseberries in Indianapolis. Troop's specimens were taken during 1904 and later during 1905. Specimens were sent to Washington and were mounted and studied by Mr. Pergande. The first sending was received on July 25, 1904. On this material Pergande made the following note: "The apterous females are pale dirty yellowish, the abdomen marked with very few dark or bluish-green, scattered spots; the eyes dark brown; the antennæ yellowish with apex of the 5th, the 6th and the spur dusky; nec-

¹ Ent. News Phila., Vol. 17, p. 59-60.

taries and tail of color of body; no lateral tubercles on body; hairs of antennæ, head, body and legs capitate; nectaries rather short."

Other sendings were received from Troop and recorded by Pergande on the following dates: August 1, 1904, August 25, 1904, October 6, 1904, May 15, 1905, and May 22, 1905. Under this last date Pergande made some color notes on the live alate form as follows: "The abdomen of the migrant is of a light glassy, bluish-green color, the head and thorax brownish-yellow with the thoracic lobes somewhat darker."

Three other records of the species have been made. Davis¹ (1910) recorded the species from Illinois and figured the sensory characters of the alate form, while Davidson² (1914) recorded the species doubtfully from California. These two workers have since written that the insects described by them were not this species. The third record is that of Headlee³ (1916).

On May 12, 1916, Mr. F. L. Simanton reported an aphid injurious to the Houghton gooseberries at Benton Harbor, Mich. Specimens of this species were submitted on May 22nd and proved to be *houghtonensis*. Mr. Ackerman forwarded young stem mothers from this same locality in the spring of 1917 and from these young rearing experiments were begun.

EGGS

The specimens received were upon small infested shoots and indicated that the eggs, the shells of which were present, are laid upon the bark under the loose folds which extend down the twig. Later twigs were received with many eggs still unhatched and these showed that the usual position is under the loose bark though eggs are also laid about the bases of the buds and occasionally upon the thorns. The eggs hatch about the middle of April.

STEM MOTHER

As soon as the young stem mothers are hatched they wander to the young opening leaves to feed and place themselves either on the under surface of the leaves or upon the petioles. The leaves immediately begin to curl and before long entirely enclose the stem mothers and any young they may have produced. In our experiments a young stem mother which began feeding on a leaf May 1 was by the 10th entirely enclosed by the rolled up leaf. By this time she had produced several young but only one remained on the curled leaf with her, the others migrating to new leaves.

¹ Jr. Econ. Ent., Vol. III, p. 485.

² Jr. Econ. Ent., Vol. VII, p. 132.

³ Rept. of the Entomologist of New Jersey for 1915.

ALATE VIVIPAROUS FORM

It is interesting to note that this form occurred in every generation in which specimens were reared from the second onward. Part of the offspring of the stem mothers thus became winged. All specimens of this form which were placed upon gooseberry in the experiments died without reproducing and this would seem to indicate that an alternate host is necessary, at least to certain individuals.

DESCRIPTION

FIFTH INSTAR (adult).—Color dark green, head and thorax brownish; eyes dark brown. Antennæ, distal part of femora and tibiæ and the tarsi brownish. Wing veins margined with brown. Cornicles pale.

Length from vertex to tip of cauda 1.44 mm. Forewing 3.2 mm. long, 0.88 mm. broad at the stigma. Length of the antennal segments and cornicles is given in the following table. There is considerable variation in the size of the specimens and the number of sensoria and this is indicated by the variations in the table. Vertex and antennal segments armed with a number of capitate hairs; similar ones also present on the legs and abdomen, and a few upon the thorax. Cornicles flanged and distinctly imbricated, slightly swollen in their distal portion. Cauda constricted near base, minutely setose and armed usually with five prominent hairs. Slight antennal tubercles are present on the head.

TABLE OF MEASUREMENTS OF THE ANTENNÆ OF THE ALATE FORM

Seg. III	No. of sen.	Seg. IV	No. of sen.	Seg. V	No. of sen.	Seg. VI base	Seg. VI unguis	
0.384	23	0.176	7	0.16	4	0.064	0.416	0.192
0.384	24	0.176	4	0.16	4	0.064	0.432	0.192
0.4	20	0.224	5	0.224	2	0.08	0.512	0.224
0.4	22	0.24	6	0.224	1	0.08	0.496	0.24
0.464	23	0.224	2	0.224	1	0.08	0.624	0.192
0.448	22	0.272	3	0.256	3	0.08	0.608	0.192
0.48	19	0.288	5	0.272	2	0.096	0.672	0.192
0.448	21	0.256	6	0.272	2	0.08	0.608	0.208
0.48	17	0.288	5	0.272	1	0.096	0.565	0.192
0.480	27	0.272	6	0.256	1	0.08	0.56	0.208

INTERMEDIATE

One intermediate was available for study. This was taken in the field by Mr. Simanton. We are unable to give, therefore, anything in regard to its occurrence or reproductive activities.

DESCRIPTION

Color similar to that of the apterous form. Length from vertex to tip of cauda 1.296 mm. Width, 0.688 mm. Form flat with the thorax broad giving a shoulder effect not found in the apterous form but apparently without distinct wing rudiments. Antennæ as follows: Segment III, 0.384 mm. and armed with 15 sensoria; IV, 0.208 mm. and without sensoria; V, 0.208 mm. and with only the distal sensorium; VI (0.08 mm.+0.432 mm.). Cornicle, 0.224 mm. Cauda, 0.192 mm. Beak extending beyond the second pair of coxæ. Body armed with the usual hairs.

SUMMER APTEROUS FORM

This form first appeared in our experiments on May 9th when young were produced by adult stem mothers. They attacked the leaves in the same manner as did the stem mothers and caused many of them to roll very tightly so that great difficulty was experienced in examining the insects. These forms also fed on the tender growing shoots and produced the beginnings even in the second generation of that distortion so conspicuous in the field.

DESCRIPTION

FIRST INSTAR.—General color uniform pale greenish due to the body contents. The skins are transparent with the exception of the tarsi, the tips of the distal segments of the antennæ and the tip of the labium. Antennæ of four segments with the following measurements: Segments I and II about 0.032 mm. long and about as thick as long; segment III, 0.096 mm.; segment IV (0.032+0.096 mm.). Segment III is armed with two stout spines near the distal sensorium and segment IV has one or two similar ones. The unguis is imbricated. Labium about as long as the antennæ.

SECOND INSTAR.—Very similar in general appearance to the insects of the last instar. The antennæ, however, possibly show a little more dusky than those of the previous stage. Measurements as follows: Segment I, 0.048 mm. long and nearly as wide; segment II, 0.032 mm. long and of about the same width; segment III, 0.16 mm.; IV (0.048+0.16 mm.). Segment III with a number of stiff hairs, similar hairs rather prominent also on the first two segments. Cornicles very short and broad.

THIRD INSTAR.—General appearance very similar to that of the last instar. Measurements as follows: Antennal segment I, 0.64 mm. long; segment II, 0.048 mm.; segment III, 0.192 mm.; segment IV, 0.096 mm.; segment V (0.048+0.224 mm.). The segments are armed in a manner similar to those of the last instar. In some cases segment III is divided.

FOURTH INSTAR.—Color as in previous instars. Measurements as follows: Antennal segment III, 0.16 mm.; segment IV, 0.096 mm.; segment V, 0.096 mm.; segment VI (0.048+0.256 mm.). Segments armed with hairs which are somewhat stouter than in the previous instars. Otherwise individuals of this instar resemble those of the previous instar.

FIFTH INSTAR (adult).—Color yellowish-green maculated with a darker green upon the abdomen, eyes brown. Sixth segment of antennæ and the distal extremities of V, IV, and III dusky, cauda and cornicles concolorous with the abdomen.

Length from vertex to tip of cauda 1.44 mm., width across abdomen 0.768 mm. Antennæ as follows: Segment III, 0.384 mm., armed with about ten subcircular sensoria in a row on the basal three-fourths of the segment, 12-14 capitate hairs also present; IV, 0.224 mm., without sensoria but with 4 or 5 capitate hairs; V, 0.208 mm., with a very prominent distal sensorium and several capitate hairs; VI (0.08+0.43 mm.), imbricated and armed with hairs on the base. Vertex with a median projection and armed with capitate hairs which are also present on the slight antennal tubercles. Body covered with similar hairs. Cornicles 0.224 mm., imbricated, almost cylindrical, not swollen as much as in the alate form. Cauda similar to that of the alate form but somewhat broader.

SEXES

The sexes which have not before been described appear upon the bushes in September and October and eggs are laid (in confinement) as early as the first week in October. Both sexes are apterous, the males being very small. Descriptions of the sexes follow:

MALE

FIFTH INSTAR (adult).—In general color the male does not differ greatly from the other apterous forms though it is darker, the antennæ being quite dusky. Average measurements are as follows: Antennal segment I, 0.064 mm.; II, 0.048 mm.; III, 0.256 mm.; IV, 0.16 mm.; V, 0.144 mm.; VI (0.048+0.256 mm.). The segments are armed with short, rather stout hairs and with small circular sensoria. These last number about as follows: Segment III with 14 or 15 of uneven size and irregularly placed over the segment, IV with usually 6, V with about 5. In some cases segments III and IV are united and measure about 0.356 mm. and possess about 22 irregularly placed sensoria. Cornicles short, not more than 0.096 mm., subcylindrical, slightly swollen near their distal extremities. Hind tibiæ about 0.624 mm. Cauda 0.096 mm. Length from vertex to tip of cauda 0.96 mm.

OVIPARA

FIFTH INSTAR (adult).—General color very similar to that of the viviparous form, the one or two large eggs within showing very distinctly through the abdominal wall. Average measurements as follows: Antennal segment III, 0.176 mm.; IV, 0.112 mm.; V, 0.112 mm.; VI (0.064+0.272 mm.). The antennæ are without secondary sensoria but the segments are armed with short rather stout spine-like hairs. Cornicles 0.144 mm., almost cylindrical, distinctly imbricated, possessing, however, quite a marked flange and a considerable constriction just proximad of it which gives the cornicle the appearance of being slightly swollen. Cauda about 0.128 mm. Hind tibia not distinctly swollen but armed with a small group of sensoria on its proximal quarter, length of tibia 0.544 mm. Length from vertex to tip of cauda about 1 mm.

THE LIFE HISTORY AND EARLY STAGES OF *MACROPSIS VIRESCENS* VAR. *GRAMINEA* (FABR.),¹ A POPLAR LEAF HOPPER IN NEW JERSEY (HOM.)

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The following notes are the results of observations made at various times during the past several years on *Macropsis virescens* var. *graminea* which was fairly abundant on Lombardy poplars growing in a nursery at Irvington, N. J.

The species overwinters in the egg stage, the eggs being found in two year old wood, usually in the neighborhood of the buds near the end of the growth, although some eggs were found in the twig tissue between the sets of buds. The eggs are inserted singly on their sides just beneath the bark tissue and the bark over the egg is raised showing

¹ Identified by E. P. Van Duzee.