

Britton & Viereck,
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INSECTS VISITING FRUIT BLOSSOMS.

207-244

SUMMARY.

1. About 6000 peach, apple and pear trees in Westville, Middletown, Westport, West Haven and Southington were sprayed in the spring of 1905 to destroy the San José scale.
2. The insecticides used were the boiled mixtures of lime and sulphur; lime, sulphur and salt; the self-boiled mixtures of lime, sulphur and sodium sulphide; lime, sulphur and caustic soda; and the kerosene and limoid mixture (see formulas, p. 196).
3. In these tests the lime, sulphur and sodium sulphide mixture gave the highest percentage efficiency, and the kerosene and limoid the lowest, though the difference was not striking, and all of the mixtures employed must be considered as fairly effective scale destroyers. The beneficial effect (if any) of salt in the boiled mixture was scarcely perceptible.
4. The cost of the materials is least for the boiled mixtures, and we recommend those where steam can be obtained for the purpose. The cost of boiling, however, makes the price nearly equal to the cost of the self-boiled mixture. Boiled lime and sulphur mixture is probably cheapest for the large orchard, and one of the self-boiled mixtures will prove cheapest for the small orchard and garden. Though somewhat easier to prepare and apply, the cost of the kerosene and limoid will make it prohibitory on a large scale.

A summarized account of these experiments was printed as Bulletin No. 1 of Immediate Information, containing four pages, and mailed to the Connecticut members of the Pomological Society in October. Only 1,000 copies were printed.

INSECTS COLLECTED FROM THE FLOWERS OF
FRUIT TREES AND PLANTS.*

By W. E. BRITTON AND HENRY L. VIERECK.

For many years horticulturists and entomologists have regarded the honey bee, *Apis mellifera* Linn., as the most important species of insect engaged in the pollination of the flowers of our fruit-bearing trees and shrubs. Benton states† that bees are the most abundant of the insects visiting the

* This paper as originally prepared was read before the meeting of the American Association of Economic Entomologists at Philadelphia, December 29 and 30, 1904, but was withdrawn from publication in the proceedings of that meeting, and has not until this time been published. The paper has been emended and rearranged, and contains important additions.

† Frank Benton, The Honey Bee, Bulletin I, Division of Entomology, p. 63.

fruit blossoms. In his study of the pollination of pear flowers ten years ago, Waite found about fifty different kinds of insects visiting pear blossoms, but that the common honey bee was "the most regular and important abundant visitor, and probably does more good than any other species."* In an address before the Georgia State Horticultural Society in 1903, Professor Wilmon Newell stated that "no insect so effectually accomplishes this distribution of pollen as the honey bee." † According to Müller also the honey bee is an abundant visitor of plum, pear, apple, currant and gooseberry flowers in Europe. ‡

The importance of honey bees in pollinating fruit flowers has been pointed out by a great number of popular and technical writers, and we were somewhat surprised in looking over the results of a few minutes' collecting in the garden in 1904 to find that honey bees were exceedingly scarce in comparison with other species of *Hymenoptera*,—or in fact with other insects. Observations were therefore continued on some of our common fruit trees. No attempt is here made to give a complete list of the insect visitors of these plants. The lists represent only the insects taken from the flowers and in sweeping over them. The collecting was done mostly by the writers at odd moments during sunny forenoons on the grounds of the Experiment Station in New Haven. The dates of the collecting were from May 4th to May 14th, 1904, during which time currant, gooseberry, apple, pear, plum and cherry were in bloom; the insects from blackberry flowers were taken June 3d, 1904. During 1905 many specimens were taken from apple and quince flowers at Branford by Rev. H. W. Winkley, and the results are incorporated in this paper. The Branford specimens were collected from May 11th to May 22d. During this time Mr. B. H. Walden also collected insects on quince, cherry, peach, raspberry and strawberry at New Haven. The accompanying list contains the results of all these collections.

It is not known to the writers that bees are kept in the immediate vicinity of the Experiment Station; there are

* M. B. Waite, The Pollination of Pear Flowers, Bulletin V, Division of Vegetable Pathology, p. 79.

† Proceedings, 27th Annual Meeting, Georgia State Horticultural Society, 1903.

‡ H. Müller, The Fertilization of Flowers (Thompson's translation).

several hives less than two miles away. Wild honey bees are probably not very abundant so near the city. We should expect them to be much more abundant at Branford.

The writers desire to express their obligations to Mr. C. W. Johnson of Boston for determining the *Diptera*. The *Hymenoptera* have been identified by Mr. Viereck.

The species of plants collected from, together with the number of specimens and species of insects taken from each, is as follows:—

Plant.	No. of Insects.	No. of Species.
<i>Ribes oxycanthoides</i> , American Gooseberry.....	883	72
" <i>rubrum</i> , Common Red Currant.....	123	59
" <i>nigrum</i> , Common Black Currant.....	154	23
<i>Prunus sp.</i> (probably a native species).....	39	15
" <i>triloba</i> , Japan Plum.....	405	44
" <i>avium</i> , Sweet Cherry.....	370	37
" <i>persica</i> , Peach.....	12	8
<i>Pyrus malus</i> , Common Apple.....	229	52
" <i>communis</i> , Common Pear.....	73	29
<i>Cydonia vulgaris</i> , Common Quince.....	77	30
<i>Rubus nigrobaccus</i> , Common High Bush Blackberry	18	8
" <i>strigosus</i> , Red Raspberry.....	22	13
<i>Fragaria virginiana</i> , Strawberry.....	11	6
Total	2,416	396

The following list shows the number of species in each order, so far as they could be determined, with the number of specimens of each species.

In the *Hymenoptera*, the sexes have been recorded separately, but workers or neuters are enumerated only in the column of totals. It will be seen that the females greatly predominate.

LIST OF INSECTS COLLECTED FROM THE FLOWERS OF FRUIT TREES AND PLANTS.

American Gooseberry, *Ribes oxycanthoides*.

HYMENOPTERA (Bees, wasps, ants).	Male	Female	Total No. Specimens
<i>Pteronus ribesii</i> Scop.		7	7
<i>Dolerus aprilis</i> Nort.		1	1
<i>Bracon</i> sp.		3	3
<i>Doryctes</i> ? sp.		2	2
<i>Apanteles</i> sp. ....		..	4
<i>Dacnusa</i> ? sp. ....		..	2
<i>Sympratis</i> ? sp.		1	1
<i>Thersilochus</i> sp.		4	4
Undetermined Tryphonids (4 species).....		..	4
" Chalcidids (4 species) .....		..	5
<i>Lasius</i> sp. ....		..	1
<i>Colletes inaequalis</i> Cress.	1	2	3
" <i>valida</i> Cress.	5	1	6
<i>Halictus fasciatus</i> Nyl.		26	26
" <i>lerouxii</i> Lep.		30	30
" (<i>Evylaeus</i>) <i>arcuatus</i> Robt.		19	19
" " <i>truncatus</i> Robt.		9	9
" " <i>pectinatus</i> Robt. ?		1	1
" (<i>Chloralictus</i>) <i>pilosus</i> Sm.		32	32
" " sp.		20	20
" " <i>zephyrus</i> Sm.		4	4
" " sp.		31	31
" " "		2	2
" " "		14	14
" " <i>sparsus</i> Robt.		417	417
<i>Trachandrena forbesii</i> Robt.	4	4	8
" " var.	1	1	2
" sp.	1	..	1
" sp.	1	..	1
" sp.	1	1	1
" <i>crataegi</i> Robt.	4	..	4
<i>Andrena carlini</i> Ckll.	1	1	1
" <i>vicina</i> Sm.	50	4	54
" <i>nasoni</i> Robt.	8	5	13
" <i>salicacea</i> Robt.	1	1	1
" (<i>Opandrena</i>) <i>bipunctata</i> Cress.	1	6	7
" sp.	5	2	7
<i>Nomada imbricata</i> Sm.		1	1
<i>Ceratina dupla</i> Say.	2	7	9
<i>Synhalonia atriventris</i> Sm.	2	..	2
Total, 46 species	85	659	760

DIPTERA (Flies, mosquitoes).	Specimens
<i>Ceratopogon fuscus</i> Coq.	10
<i>Rhamphomyia nana</i> Loew.	1
<i>Lonchoptera lutea</i> Panz.	20
" <i>riparia</i> Meig.	20
<i>Eristalis bastardi</i> Macq.	2
<i>Panzeria radicum</i> Fabr.	4
<i>Homalomyia scalaris</i> Fabr.	1
<i>Phorbia fusciceps</i> Zett.	3
<i>Fucellia fucorum</i> Fall.	2
<i>Scatophaga stercoraria</i> Linn.	6
<i>Chlorops assimilis</i> Macq.	8
<i>Elachiptera costata</i> Loew.	19
<i>Oscinis coxendix</i> Fitch.	3
" sp.	1
<i>Drosophila graminum</i> Fall.	1
" sp.	2
<i>Agromyza angulata</i> Loew.	2
<i>Desmometopa m-nigrum</i> Zett.	1
" <i>latipes</i> Meig.	1
Total, 19 species	107

COLEOPTERA (Beetles).	Specimens
<i>Phyllotreta sinuata</i> Steph.	1
<i>Epitrix cucumeris</i> Harris.	2
<i>Diabrotica vittata</i> Fabr.	1
<i>Adalia bipunctata</i> Linn.	1
Total, 4 species	5

HEMIPTERA (Bugs, leaf-hoppers, etc.).	Specimens
<i>Lygus pratensis</i> Linn.	4
Undetermined Tettigonid	1
" Jassid	6
Total, 3 species	11

Common Red Currant, *Ribes rubrum*.

HYMENOPTERA (Bees, wasps, ants).	Male	Female	Total No. Specimens
<i>Dolerus aprilis</i> Nort.	1	1	2
<i>Apanteles</i> sp.	1	..	1
" " .....	..	1	1
<i>Sympratis</i> ? sp. ....	..	1	1
<i>Exochus semirufus</i> Cress.	1	..	1
Undetermined Tryphonid .....	..	..	1
<i>Ichneumon subcyaneus</i> Cress.	1	..	1
" <i>seminiger</i> Cress. ....	..	1	1
Undetermined Chalcidid .....	..	..	1
" " .....	..	..	1
<i>Crematogaster lineolata</i> Say. ....	..	..	1

HYMENOPTERA (Bees, wasps, ants)—Cont'd.	Male	Female	Total No. Specimens
<i>Cryptocheilus conicus</i> Say.	1	..	1
<i>Colletes valida</i> Cress.	2	..	2
<i>Oxystoglossa similis</i> Robt. ....	..	1	1
<i>Halictus fasciatus</i> Nyl. ....	..	1	1
" (<i>Evylaeus</i>) <i>truncatus</i> Robt. ....	..	1	1
" (<i>Chloralictus</i>) <i>zephyrus</i> Sm. ....	..	7	7
" " <i>sp.</i> ....	..	13	13
" " <i>sparsus</i> Robt. ....	..	3	3
" " <i>n. sp. ?</i> ....	..	1	1
" " <i>n. sp.</i> ....	..	1	1
<i>Trachandrena crataegi</i> Robt.	3	..	3
" <i>forbesii</i> Robt.	1	..	1
" " <i>var.</i>	1	1	2
<i>Andrena mandibularis</i> Robt. ....	..	1	1
" <i>nasoni</i> Robt.	3	1	4
" <i>vicina</i> Sm.	3	..	3
" <i>sp.</i>	1	..	1
Total, 28 species	19.	35	58
DIPTERA (Flies, mosquitoes).			Specimens
Undetermined Chironomid			1
<i>Sciara sp.</i>			1
<i>Rhamphomyia brevis</i> Loew.			1
<i>Pipiza albipilosa</i> Will.			1
" <i>femorialis</i> Loew.			1
<i>Melanostoma mellinum</i> Linn.			1
<i>Hyalomyodes triangulifera</i> Loew.			1
<i>Panzeria radicum</i> Fabr.			4
<i>Sarcophaga helioides</i> Town.			1
" <i>sp.</i>			1
" "			1
<i>Lucilia caesar</i> Linn.			1
<i>Phormia regina</i> Meig.			1
<i>Ophyra leucostoma</i> Wied.			1
<i>Anthomyia radicum</i> Linn.			3
<i>Phorbia cinerella</i> Fall.			1
" <i>fusciceps</i> Zett.			16
<i>Fucellia fucorum</i> Fall.			2
<i>Scatophaga stercoraria</i> Linn.			6
<i>Sepsis violacea</i> Meig.			1
<i>Nemopoda cylindrica</i> Fabr.			1
<i>Piophilha casei</i> Linn.			8
<i>Chlorops variceps</i> Loew.			1
<i>Oscinis coxendrix</i> Fitch.			2
<i>Agromyza diminuta</i> Walk.			1
<i>Desmometopa latipes</i> Meig.			1
" <i>m-nigrum</i> Zett.			1
Total, 27 species			61

COLEOPTERA (Beetles).	Specimens
<i>Anthrenus verbasci</i> Linn.	1
<i>Adalia bipunctata</i> Linn.	1
Total, 2 species	2
HEMIPTERA (Bugs, leaf-hoppers, etc.).	Specimens
<i>Lygus pratensis</i> Linn.	1
Undetermined Psyllid	1
Total, 2 species	2

Black Currant, *Ribes nigrum*.

HYMENOPTERA (Bees, wasps, ants).	Male	Female	Total No. Specimens
<i>Apanteles sp.</i>	1	..	1
<i>Thersilochus sp.</i>	3	3
<i>Vespa germanica</i> Fabr.	1	1
<i>Agapostemon radiatus</i> Say.	1	1
<i>Halictus lerouxii</i> Lep.	2	2
" (<i>Evylaeus</i>) <i>arcuatus</i> Robt.	6	6
" " <i>truncatus</i> Robt.	19	19
" (<i>Chloralictus</i>) <i>sparsus</i> Robt.	81	81
" " <i>zephyrus</i> Sm.	9	9
" " <i>sp.</i>	2	2
" " "	4	4
" " <i>pilosus</i> Sm.	8	8
<i>Andrena vicina</i> Sm.	2	..	2
<i>Bombus consimilis</i> Cress.	1	1
" <i>pennsylvanicus</i> DeG.	1	1
Total, 15 species	3	138	141

DIPTERA (Flies, mosquitoes).	Specimens
<i>Eristalis bastardi</i> Macq.	1
<i>Lucilia caesar</i> Linn.	3
<i>Scatophaga stercoraria</i> Linn.	2
<i>Nemopoda cylindrica</i> Fabr.	1
<i>Piophilha casei</i> Linn.	1
<i>Chlorops assimilis</i> Macq.	1
<i>Phorbia fusciceps</i> Zett.	3
Total, 7 species	12
COLEOPTERA (Beetles).	Specimen
<i>Adalia bipunctata</i> Linn.	1
Total, 1 species	1