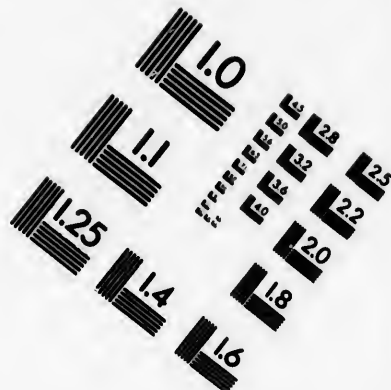


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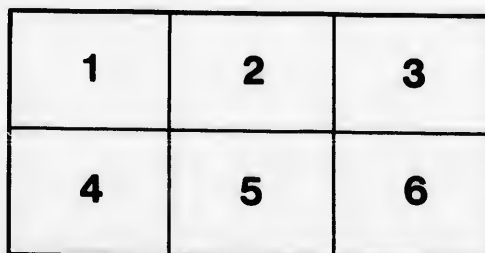
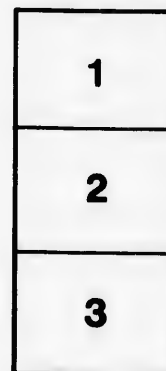
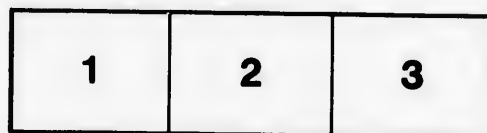
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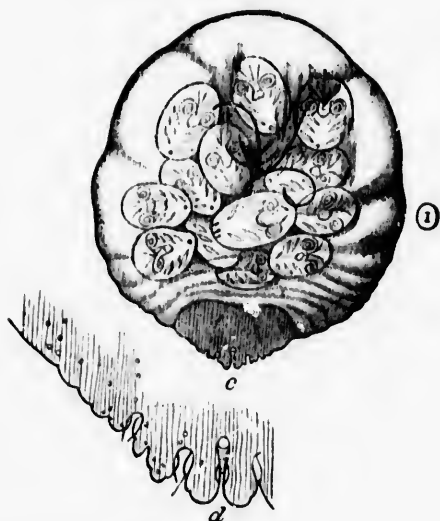
BULLETIN 106.

JUNE, 1897.

Ontario Agricultural College and Experimental Farm

# THE SAN JOSE SCALE.

(*Aspidiotus perniciosus*).



By J. H. PANTON,  
PROFESSOR OF BIOLOGY, ONTARIO AGRICULTURAL COLLEGE.

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## BULLETIN 106.

### SAN JOSE SCALE.

(*Aspidiotus perniciosus*.)

The discovery of the fact that the San José Scale has appeared in one of the most important fruit growing districts in Ontario demands that we furnish at as early a date as possible information regarding its habits, etc. For the past four years it has excited much alarm among fruit growers in the Eastern States, and a wealth of literature has been published concerning it, so that all information needed is readily obtained from the numerous bulletins already issued from the Agricultural Department at Washington and experiment stations in the United States. No insect is more fitted to menace the fruit-growing interests of our Province than this San José Scale.

#### WHY THE INSECT CAUSES ALARM.

1. It possesses marvellous powers of reproduction. A single female that has wintered over may be the progenitor of millions in a single season; some have computed that her progeny may reach the incredible number of 3,000,000,000. There may be four generations in a season, the adult females of each giving birth to living young for five or six weeks, the progeny of these bearing young when about thirty days old. Each female brings into existence 100-500 insects during her lifetime. Thus it will be seen that a great confusion of generations will soon exist, as there may be upon a plant at one time the young of several generations.
2. Infested young trees perish in two or three years.
3. The range of food plants is extensive, and all parts of the plant may be attacked: leaf, stem, twig and fruit. The scale has been found upon the peach, pear, plum, apple, cherry, apricot, quince, currant, gooseberry, raspberry, rose, hawthorn and even elm.
4. The insect and scale are exceedingly minute. The scale is often much the same color as the bark of the infested trees. Most are less than one-sixteenth of an inch in diameter, and are thus almost invisible to the naked eye.
5. It is readily introduced by nursery stock and fruit from infested trees.

### ITS PRESENT DISTRIBUTION.

Although first observed in 1893, it has now been located in Alabama, Florida, Georgia, Louisiana, Virginia, Delaware, Idaho, Indiana, Massachusetts, Maryland, New York, Ohio, New Jersey and Pennsylvania; in 1894 it was reported in British Columbia, and now unfortunately in June of 1897 we have to announce it as present in Southern Ontario. Some specimens are reported to have been found last winter near Chatham.

### WHEN AND WHENCE IT CAME.

The general consensus of opinion after much investigation is, that it came originally from California, where it was noticed as a pest in the San José Valley as far back as 1873. In 1880 Prof. Comstock described it, and named the insect *Aspidiotus perniciosus*, on account of its serious character as a scale. It is believed to have been introduced into the East in 1886-7 by two New Jersey nurseries, one at Burlington, the other at Little Silver. These firms imported from the San José Valley a variety of Japanese plum, the Kelsey, which was claimed to be curculio proof. In 1889 or 1890 the first scaly stock from this importation began to be distributed, and in August of 1893 the San José Scale was first observed on the eastern side of the Rocky Mountains. It was located in an orchard of Charlottesville, Virginia, and since then each season has extended the list of infested districts.

### HOW IT MAY BE DISTRIBUTED.

In the work of distribution, the insect itself can do but little, as it is quite helpless to move from place to place. Its life of active movement is very brief—a few hours, at most, a day or two. It moves only a few inches from its birth-place, then settles, becomes covered with a scale, and in the case of the female, remains fixed for life, and begins producing young in about thirty days. After becoming fixed, it lives by sucking the sap of the plant upon which it is located. The males have wings and may fly about at maturity, but the females are always wingless. During the few hours or days the tiny lice are moving about, they may get upon birds, such insects as ants and small beetles, and by them be carried to other trees. One observer has noticed that in infested districts, the scale is often more common near a bird's nest. As trees in an nursery grow close together, they present favorable conditions for being infested. Fruit from infested trees may have the scale upon it; even wind may assist in spreading these insects that appear at first so comparatively helpless to travel by their own efforts. Thus *birds, insects, fruit, scions* from infested trees, infested *trees*, and *wind* may all be important factors in the distribution of the scale.

### THE LIFE HISTORY OF THE INSECT.

The nearly fully grown insect passes the winter beneath its wax-like scale. About June the young begin to appear, as exceedingly minute, six-legged insects, like yellowish specks moving about. They creep about only for a few hours, at

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most a day or two, then settle but a few inches from their birthplace, and become attached to the spot from which the females never move. During their sedentary life the females lose their feelers and legs, and have neither eyes nor wings. The males, however, have legs, feelers (antennæ) eyes and wings in the adult condition. The scale of the female is circular, with a small nipple in the centre. This scale is from a twelfth to one-twentieth of an inch in diameter, and may be of a light or dark gray color, and usually is much the same color as the bark; the nipple in the centre may be a pale yellow or blackish color. The scale of the male is oblong, with the nipple near one end, and is thus readily distinguished from that of the female. The female brings forth living young, and does not lay eggs, as is usually the case with scale insects, such as the oyster shell and scurfy scales. She may bring into existence from 100 to 500 young during the six weeks of her existence after reaching the adult stage.

The males develop about a week sooner than females, the latter taking about five weeks, and emerge from their scales as exceedingly minute two-winged, fly-like insects. From June, when the young appear, a constant succession of generations is observed.

The scale of these insects is formed from a waxy secretion which commences soon after they come into existence, and forms a protective covering as development proceeds. In the earlier stages of growth the scale presents a somewhat grayish-yellow color, and gradually becomes darker.

The general appearance upon affected twigs is that of a grayish, slightly roughened scurfy deposit. This hides the natural reddish color of the young limbs of the peach, pear and apple. They sometimes even look as if sprinkled with ashes. If the scales are crushed, a yellowish oily liquid will appear from the crushed soft yellow insects beneath the scales. Examined in summer, many show orange-colored larvæ, snowy-white young scales, mingled with old brown or blackened matured scales. This insect produces a peculiar reddening effect upon the skin of the fruit and of tender twigs. An encircling band of reddish discoloration around the margin of each female scale is very marked on the fruit of pears. The cambium layer of young twigs where scales are massed is usually stained deep red or purplish. Where the scales are few the purplish ring surrounding each is quite distinguishable.

#### REMEDIES.

The remedies for this scale present three forms: *Corrosive washes*, such as whale oil soap; *penetrating substances*, such as gases or kerosene emulsion, and *varnishes or resin washes* which cover the scale so as to prevent the escape of the young.

1. The use of hydrocyanic acid or the gas treatment is very effectual, but it is only practicable in certain cases, especially in the treatment of imported nursery stock. The following method is given in Bulletin 87, of the New York Experiment Station, Geneva: "This gas is lighter than air, hence will work better if the generator is placed below the pile of trees to be treated. A convenient way would be to make a rack a little less than six feet long, five feet wide, four feet

high. The bottom of the rack could be made of loose slats raised a few inches above the ground to allow room to place the gas generator under the rack. When the rack is filled with trees, a piece of gas-tight canvas thrown over the whole and fastened down at the sides by throwing dirt on the margins would complete the apparatus. One side could be left open till the water and chemicals are placed in the dish and the dish slipped beneath the rack. This gas is a deadly poison, and great care should be used not to breathe it while placing the dish under the rack.

"To generate the gas pour three fluid ounces of water in a glazed earthenware vessel, to this add one fluid ounce of sulphuric acid; place under the trees and then add one ounce by weight of fused cyanide of potassium. This will make gas enough to fill a space of 150 cubic feet." An hour's exposure will likely kill all the scale insects.

2. One of the most effectual remedies, and one readily applied, is the use of whale-oil soap, two pounds in one gallon of water. Apply this in the fall just as the leaves drop off, before the scales harden, and again in spring just before the trees bloom. Some recommend a weaker solution in the fall, one pound to one gallon of water, then just before the buds swell in spring, the stronger solution, two pounds to one gallon of water. Even the use of common soap has been followed by good results, but whale-oil or fish oil soap is preferable. Kerosene emulsion, diluted with nine parts water, or whale-oil soap, one pound to four gallons of water, is good for summer treatment, as soon as the lice are moving. Three or four applications of this at intervals of ten days will destroy many insects, but as the females are continually producing young throughout the summer, the spraying should be kept up to be effectual. Fall or winter treatment with strong solutions is decidedly the most successful.

3. Pure kerosene is destructive to the scales, but will kill the trees unless great care is observed in its application.

The use of resin washes, though successful in California, has not given very decided results in the east.

There are two enemies to the scale among insects, both of which are reported to aid very materially in keeping the scale in check. One, the "Twice-stabbed Ladybird" (*Chilocorus bivulnerus*), is very common on infested trees, apparently feeding upon the scale; the other is a chalcid parasite (*Aphelinus fuscipennis*).

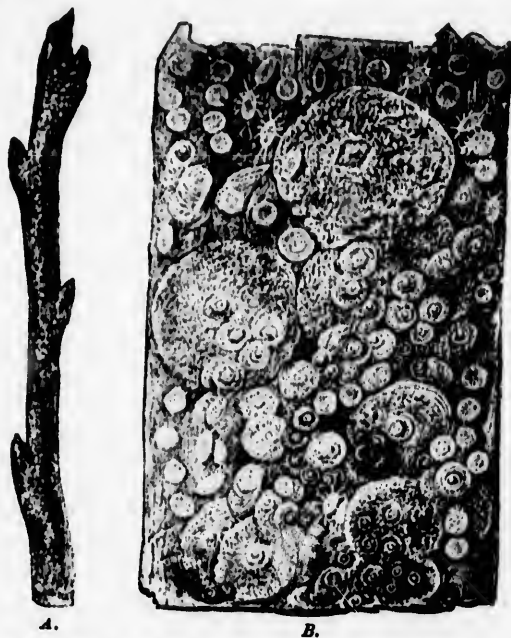
#### SUGGESTIONS.

1. Examine carefully sickly trees and trees or scions brought from nurseries in infested districts.
2. If only a few trees are infested destroy them.
3. Trees infested, if well cut back and treated with whale-oil soap, as directed, may be largely saved.
4. Orchards set out within the last six years with trees from infested States, may be suspected. They should be carefully examined.
5. Examine fruit from infested localities.

T  
Agriculture  
Niagara

Appearance

This most excellent cut taken from Bulletin 3, U. S. Department of Agriculture, represents exactly what the writer of this bulletin has seen in the Niagara District.



Appearance of scale on bark ; *a*, infested twig—natural size ; *b*, bark as it appears under hand lens, showing scales in various stages of development and young larvae.

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Newspapers receiving this Bulletin will please notice it in their columns, calling attention to the presence of a new enemy to fruit growing, and advising all interested to apply to the Department of Agriculture at Toronto for a copy of the Bulletin.

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