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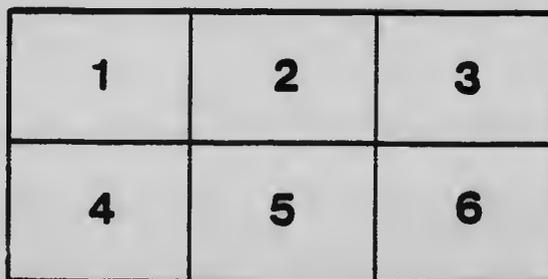
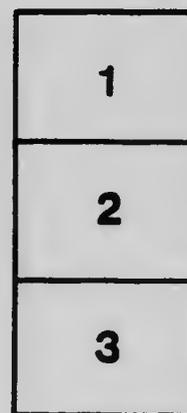
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BULLETIN No 37

The Enemies of our Orchards and Vegetable Gardens

HOW TO FIGHT THEM

— BY —

GEORGES MAHEUX, B. A., F. E.
Entomological Inspector



Cliché B. G. Pratt, Company.

THE LESSON OF A CROP

On the left are apples from a sprayed tree.
On the right, in a basket, are the sound apples from a tree not sprayed.

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The Enemies of our Orchards and Vegetable Gardens

HOW TO FIGHT THEM

In the few following pages, the reader will find a list of the insects and diseases harmful to fruit trees, vegetables and ornamental trees. After that, the best preventives and surest remedies will be indicated. It seems needless to lay stress upon the necessity of fighting those enemies which frequently reduce crops to their simplest expression. When one thinks that Canadian farmers yearly lose, through those parasites, over ten million dollars on their fruits and vegetables alone, it is evident that such a heavy loss must be diminished at any cost. The measures we advise below will enable that result to be obtained and the enormous sum of which the farmer is deprived, to be restored to him if he will put them into practice.

INSECTS

Principal species of injurious insects

To fruit trees:

Fruit: codling moth and apple maggot, plum curculio, apple curculio, cherry maggot, green-fruit worm.

Buds: bud-moth.

Leaves: tent, yellow-necked, red humped, white-marked, caterpillars, autumn and spring canker worms, leaf roller and miner, pear-tree slug, plant lice, pear psylla.

Bark: buffalo tree-hopper, woolly ayhis, oyster shell scale and plum tree scale.

Burrowing under the bark and in the wood: flat-headed apple-tree borer, round headed apple borer, imbricated snout-beetle.

To fruit bushes:

Raspberry: cane-borer, red necked and crown borer.

Strawberry: striped flea-beetle, plant lice, white grub, weevil.

Gooseberry and currant: currant worm, plant lice, saw-fly, striped bug, cane-borer.

To Vegetables :

- Cal-Jage:* imported cabbage worm, root maggot, cut-worms, zebra-caterpillar.
- Turnip:* flea-beetle, plant lice, red beetle.
- Potatoes:* colorado potatoe beetle, white grub, flea-beetle, blister-beetle, wire-worm, stalk borer.
- Onion:* onion maggot.
- Carrot:* carrot rust-fly.
- Celery:* celery caterpillar.
- Pea:* pea-weevil, plant lice, blister-beetles.
- Bean:* weevil, blister-beetles.
- Asparagus:* asparagus beetle.
- Cucumber:* striped beetle, twelve-spotted beetle.
- Squash:* squash bug.
- Melon:* blister-beetle, plant lice.
- Beet-root:* flea-beetle, blister-beetle, plant lice.
- Tomato:* tomato worm.

Ornamental trees :

Tent-caterpillar, elm-tree borer (*saperda*), poplar-tree borer, larch saw-fly, spruce bud-worm, pine-weevil, poplar weevil, birch and oak borer, brown-tail moth, gypsy moth, bark-beetles, white-marked tussock-moth, forest tent caterpillar, fall web-worm, elm leaf beetle, plant lice, etc.

Preventives

- 1—*Care and cleanliness.* Remove all rubbish and refuse which are breeding places for the insects. Remove diseased parts and withering branches from the trees.
- 2—*Gather, before the month of April,* the egg-masses on the twigs and the cocoons on the bark, branches, fences, etc. All little balls of whitish or yellowish silk, should be gathered in a box or bag and burned.
- 3—*Brush the bark of the apple-trees,* especially the old ones, destroy the scale insects settled there.
- 4—*Washing the trees* with lime in the spring and autumn contrioutes destroying a great many parasites, their eggs or cocoons.
- 5—*Protecting the foot* of apple trees to a height of from 12 to 15 inches, not only prevents mice from gnawing the bark, but also the insects from laying their eggs. Tarred felt paper, wire netting, etc., are used for that purpose.

6—*Ploughing the soil* of the vegetable garden and orchard in the autumn has the effect of uncovering a good many cocoons whose occupants will be killed by water from melting snow or rain-water.

7—*Banding the tree-trunk* or put around it a strip of something gummy or greasy, "tree-tanglefoot", coal-tar, a mixture of castor oil and resin, or of lard and sulphur will catch most caterpillars and moths trying to ascend the trees. The sticky substance must be removed when dried or covered with insects. The strip is usually put on from 4 to 5 feet from the ground.

8—*On vegetables:* the eggs, larvae and insects seen on plants must be removed at once, and frequent visits should be made for the purpose.

9—*The first spraying* of the orchard prevents the growth of the bud-moth, kills scales, eggs and small caterpillars.

10—*Around the foot of the cabbage*, a ring of tarred paper is laid quite flat on the ground, leaving only a space in the middle large enough to allow the stalk to pass through. This is an excellent preventive against the cabbage maggot.

11—*Watch continually* the trees in the orchard and vegetables in the garden, remove and destroy the first noxious insects that make their appearance.

12—*Specially protect birds* (except sparrows), most of which feed chiefly on insects. To that end, make boxes with openings and hang them on the trees so that the birds may nest there and breed.

13—*Some effective means for checking white grubs and cutworms:*

a). Do not plant tender plants (cabbage, tomato, etc.), before June.

b). Spray cabbage, turnips, etc., as soon as the first grubs appear and repeat the spraying frequently. Soot and wood-ashes may also be sprinkled.

c). Mix the onion seed with soot or wood-ashes and sow the whole together. If this precaution has not been taken spread a thin layer of hen manure on the soil.

d). Pull up and destroy the cabbage stalks after the crop is gathered.

Remedies

1—*Shaking.* Many small insects and some caterpillars, drop to the ground when the portions of the tree on which they lie are strongly shaken. To better succeed, a padded mallet with a long handle is used for striking the branches loaded with clusters of caterpillars. If care is taken to first spread a sheet on the ground, it is easy to gather the insects, etc. and burn them; the banding process mentioned above may also be followed.

2—*Destruction of tents and caterpillars.* With a averruncator the parts of branches covered with tents and caterpillars are cut off and burned. Trying to burn the tents with the flame of a torch endangers the life of the tree.

3—*Spraying*. This is the most complete and effective remedy and the only practical one for orchards and gardens of half an acre and over. Many substances are used for this purpose and we recommend only the best. A distinction must be made between two classes of insects; the biting insects provided with jaws, nibble the leaves, fruit, bark or wood, and the best way to fight them is by poisoning their food. The other class consists of the suctorial or sucking insects provided with a long snout with which they pierce the tissues of the plant and suck its sap; thus their food cannot be poisoned but they are killed with substances that stifle them through contact: the plant-lice and scale insects belong to this category.

4.—*Insects boring galleries in the wood*. Their presence is betrayed by worm dust at the foot of the tree. A flexible wire introduced into the opening of the gallery, will sometimes reach the borer and kill it; this can, however, be more easily effected by squirting bisulphide of carbon into the gallery with a syringe. The opening is then closed with putty or soap and, when opened 24 hours after, the insect will be found dead.

5—*In fields of cabbages, turnips and bean*, cutworms often do much damage. An excellent way to get rid of them is to spread around the threatened plants a mixture of one pound of Paris green and fifty pounds of bran slightly moistened. The worms are attracted by it, leave the plant, eat the bran and die poisoned. It is preferable to spread the bran in the evening.

6—*By destroying the refuse and what is left after the crop is gathered*, not only is a work of cleanliness done, but many insects seeking a refuge for the winter, will be destroyed.

DISEASES

Principal species of diseases

Fruit trees :

Roots: crown gall.

Trunk: apple canker, necrosis of the wood, blight, bitter rot, blackrot canker, etc.

Branches, leaves: blight, scab, black rot, bitter rot, spots on leaves, leaf curl.

Fruit: scab, dry, bitter and brown rot.

Fruit bushes :

Raspberry: blight, yellows, anthracnose.

Strawberry: spots on leaves.

Gooseberry: mildew, anthracnose, blister rust (also on white pine).

Currant: mildew, anthracnose, blister rust.

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Vegetables :

- Cabbage, cauliflower, turnip:* black rot, soft rot, white cystopus.
Potato: balk leg, dry rot, common scab, powdery scab, early and late blight.
Onion: mildew, smut, rust.
Carrot: bacterial rot, rhizoctonia.
Celery: blight, leaf spot.
Peas, beans: mildew, blight, anthracnose and bacteriosis of beans.
Melon, squash, cucumber: mildew, stalk rot, bacterial wilt.
Beet-root: heart-rot, spotted leaves, rhizoctonia.
Tomato: mildew, rot.

Ornamental trees :

- Brown, white, dry, heart and root rot, spotted leaves, white pine blister rust, etc.

Preventives

1—*Spraying with Bordeaux mixture* is an effective preventive of disease, if done in time. Sulphur mixture is also used. (See further on for more ample details).

2—*Keep the orchard clean*, remove all that is unnecessary.

3—*Dress all wounds* as soon as possible. For that purpose tar, grafting wax, creosote, white lead, or bichloride of mercury are used. The whole wound or wood stripped or its bark, must be covered. **NEVER PAINT THE BARK OF A TREE.**

4—*For vegetables*, the seed must not be sown in soil previously infested.

5—*Use only perfectly sound seeds.*

6—*Steeping seed potatoes* in a solution of one pint of formaline to thirty gallons of water is a good preventive against scabs.

7—*Plant only perfectly sound trees* and buy them from conscientious and honest nurserymen.

8—*Treat the soil as follows:* destroy all disease germs it contains, if necessary; put a pint of formaline in twelve and a half gallons of water; sprinkle the soil at the rate of two thirds of a gallon to the square foot; then cover the soil for twenty-four hours, air and stir it; seed may be sown ten days after, the soil has been thoroughly disinfected.

9—*Use only decomposed manure* in order that the disease germs may be harmless.

10—*Destroy the weeds* which often infest good plants.

Remedies

1—*Pull up, or cut off and burn trees, plants or parts seriously affected by disease; this will prevent infection from spreading.*

2—*Remove and burn diseased bark, and paint the spot.*

3—*Remove the rotten wood down to the sound wood and daub with tar (put none on the bark), then cover with paint or grafting wax. If the wound is deep, it must be filled with cement. (See Bulletin No. 16 for manner of proceeding).*

4—*Gather and burn all spotted fruits and leaves; then spray with Bordeaux mixture.*

5—*Contaminated fruit and sound must not be put together; the former will spread disease to the latter.*

APPLY TO THE HORTICULTURAL SERVICE IF YOU NEED INFORMATION RESPECTING THE MANNER OF PLANTING AND KEEPING AN ORCHARD OR VEGETABLE GARDEN.

WRITE TO THE ENTOMOLOGIST AND TELL HIM THE INSECTS AND DISEASES THAT TROUBLE YOU; HE WILL HASTEN TO TELL YOU THE BEST MEANS FOR GETTING RID OF THEM.

SEND HIM SPECIMENS OF THE INSECTS OR DISEASES THAT SEEM NEW OR STRANGE TO YOU.

SPRAYING MIXTURES

INSECTICIDES

We have seen, in the chapter on insects, that the best way to get rid of those minute but formidable pests, is to poison them. There is a difference in the manner of doing it. If we have to deal with leaf-feeding insects, such as tent and other caterpillars, cabbage worms and potato beetles, we must poison their food. The following substances or poisons are the most recommendable.

Lead arsenate. Leaf-eating insects are fond of this poison. To be effective it must contain 25% of arsenic. It is generally used in the following proportions:

Water, 50 gallons; arseniate of lead (paste) 2 to 3 pounds.

Water, 50 gallons; arseniate of lead (powder) 1 to 2 pounds.

The poison is dissolved in the water and the whole is mixed.

Used with fungicide. A double object is attained by mixing substances for insects with others for diseases. To Bordeaux mixture or sulphur mixture, the poison is added in the proportions given above, the mixture replacing the water; say 2 to 3 pounds of arseniate of lead (paste) to from 40 to 50

mixture. It is better to first dissolve the poison in a little water, for the mixture will then be more complete.

Paris green. A very well known product, also with arsenic as base, largely used for potato beetles. It is but little used for fruit trees because repeated applications damage the leaves; to obviate that drawback, a little quick-lime is added.

Water 50 gallons; Paris Green $\frac{1}{2}$ pound.

Water 50 gallons; Paris Green $\frac{1}{2}$ pound, quick-lime $\frac{1}{2}$ pound.

When mixed with Bordeaux mixture, it gives excellent results with a dose of 4 ounces to 50 gallons; it is an excellent destroyer of both insects and fungi.

The second group of injurious insects are the suckers. It is impossible to poison their food which is the sap of the tree or of the plant. Recourse is had to substances that kill them through contact, either by obstructing their breathing organs or by penetrating into their bodies by the same organs.

Convincing experiments have revealed the qualities of a powerful insect destroyer, which enables the attaining of that end.

Sulfate of nicotine. This is sold, all prepared, by seed-dealers at the price of 75 cents per half-pound box. In the trade it is called "Black Leaf 40", and is made by the Kentucky Tobacco Product Co. As it has to be applied to the insect itself, it is a remedy and not a preventive.

When used alone: $\frac{1}{2}$ pound of sulphate of nicotine in 40 gallons of water.

In a mixture: $\frac{1}{2}$ pound for 40 gallons of mixture. If the sulphate of nicotine is used for vegetables, add, for 40 gallons of water, half a pound of hard soap, previously dissolved in hot water; this will have the effect of making the substance better adhere to the leaves.

FUNGICIDES

This name is given to chemical substances or mixtures used for preventing the development of plant diseases. Prevention is still the best and almost the only sure way of getting rid of those parasites; once installed and in a growing condition, it is almost impossible to check them. Thus the proper treatment consists in making the place they have chosen unfit and fatal for their living. The destroyer acknowledged to be the best is the Bordeaux mixture which has been in use for nearly a century. Of late years, another composition, called lime-sulfur, has come into general use in the commercial orchards of our country. The composition and manner of preparing of these two fungus-destroyers is given below.

Bordeaux mixture.

Formula: Sulphate of copper (blue vitriol) 3 pounds.
Quick-lime (best quality) 3 pounds.
Water..... 40 gallons.

In a barrel containing 20 gallons of water a bag of blue vitriol is hung for a night; in another barrel the quick-lime is slaked with a little water, and then milk of lime is made by gradually adding water to make 20 gallons. When both substances have thus been thoroughly diluted separately they must be poured at the same time into a third barrel of 40 gallons and be briskly shaken in order to mix the elements well; then put into the sprayer and stir often.

If both insects and diseases have to be got rid of at the same time, one must not forget to put into the 40 gallons of mixture so prepared, some arsenate of lead previously dissolved in a little water. The quantity to be used varies between 2 and 3 pounds for arseniate in paste and 1 to 2 pounds if in powder. If Paris Green is chosen as poison, 4 ounces are added to 40 gallons of mixture. Lastly, to kill the suckers, plant lice, etc., half a pound of sulphate of nicotine should be added for the same quantity of mixture, say 40 gallons.

Lime sulphur

Formula: Sulphur.....	100 pounds.
Lime.....	50 ponds.
Water.....	50 pounds.

Slake the lime, add 50 gallons of water to make milk of lime, then pour in the 100 pounds of sulphur. Mix the whole thoroughly and boil for an hour.

The substance obtained is concentrated like that bought all prepared, and it must be reduced. A hydrometer is used to ascertain how many gallons of water must be used for diluting a gallon of mixture. Everybody knows that, for the first spraying, a mixture of 1.030 degrees of density is needed; 1.008 for the second and 1.006 for the third. The figure read on the instrument will always be above 1.230. If, for instance, we have 1.230, divide 230 by 30, which gives 7: which means that, for the first spraying 1 gallon of mixture will have to be taken for 7 gallons of water. It is clear that for the second and third it will be necessary to divide the figures to the right of the point by 8 and 6 respectively.

BUY YOUR INSECTICIDES AND FUNGICIDES AND SPRAYING APPARATUS THROUGH YOUR HORTICULTURAL, AGRICULTURAL OR CO-OPERATIVE SOCIETY.

INFORM THE HORTICULTURAL SERVICE OF YOUR PLANS FOR PLANTING ORCHARDS, ORNAMENTAL TREES AND FLOWER SHRUBS, SO THAT IT MAY HELP YOU TO CARRY THEM OUTMORE SUCCESSFULLY.

CLEAN YOUR APPARATUS WELL BEFORE PUTTING THEM AWAY FOR THE WINTER.

GET, IN THE AUTUMN, WHATEVER SPARE PIECES YOU WILL WANT IN THE FOLLOWING SPRING.

TABLE OF SPRAYINGS
CLEAR, SIMPLE, EASY TO CONSULT

Kind of plants

TABLE OF SPRAYINGS

CLEAR, SIMPLE, EASY TO CONSULT

Kind of plants	1ST SPRAYING	2ND SPRAYING	3RD SPRAYING	REMARKS
FRUIT TREES				
Apple and Pear trees	WHEN? When the buds begin to grow green. HOW? Bordeaux or sulphur mixture, density 1.030.	WHEN? When the blossoms begin to reddish. HOW? Bordeaux or sulphur mixture, density of 1.008 with arsenate of lead.	WHEN? When the blossoms begin to fall. HOW? Bordeaux or sulphur mixture, density 1.006 with arsenate of lead.	4th spraying, if necessary, same as third, 15 days after. If there are any plant lice, add sulphate of nicotine to the mixture used.
Plum and Cherry trees	WHEN? When the buds begin to grow green. HOW? See 1st spraying of apple and pear trees.	WHEN? When the plums and cherries are formed. HOW? See 2nd spraying of apple and pear trees.	WHEN? Two weeks after the second. HOW? See 3rd spraying of apple and plum trees.	If there are any plant lice, add sulphate of nicotine to the mixture used.
FRUIT BUSHES				
Gooseberry and currant bushes	WHEN? When the buds begin to grow green. HOW? Sprinkle sulphur for mildew before the leaves open. See 1st spraying of apple and pear trees.	WHEN? Immediately before the blossoms appear. HOW? Bordeaux mixture with arsenate of lead.	WHEN? Immediately after the fruits are formed. HOW? Same as second.	Add sulphate of nicotine for plant lice.
Raspberry bushes	WHEN? Before the buds appear. HOW? Bordeaux mixture.	WHEN? When the stalks are 6 to 8 inches high. HOW? Bordeaux mixture with arsenate of lead.	Watch the insects carefully, and if there is no disease, use arsenate of lead alone as often as necessary.	
Strawberries	WHEN? When necessary.	HOW? Bordeaux mixture.		
VEGETABLES				
Potato, turnip, melon, cucumber, squash, peas, beans	WHEN? When necessary (No poison on cabbage and cauliflower; only mixture.) HOW? Bordeaux mixture with arsenate of lead or Paris green.			If there is no disease use only arsenate of lead or Paris green.
ORNAMENTAL TREES				
Maple, elm, oak, beech, poplar, birch, bass-wood, etc.	WHEN? When necessary. HOW? Bordeaux mixture and arsenate of lead; add sulphate of nicotine for plant lice.			

IMPORTANT NOTE: It is forbidden by law to spray plants with any poisonous substance when they are in full bloom. Any person infringing this law is liable to a fine.

