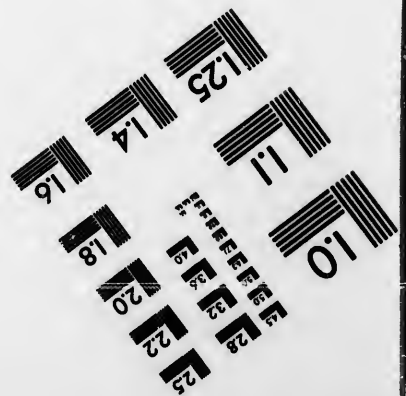
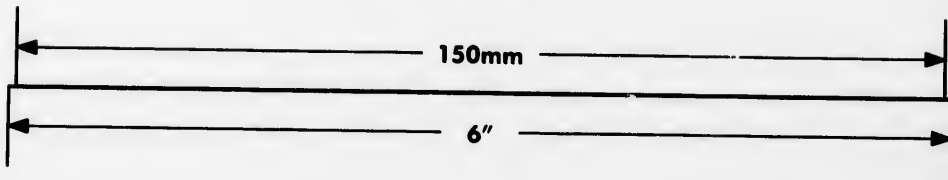
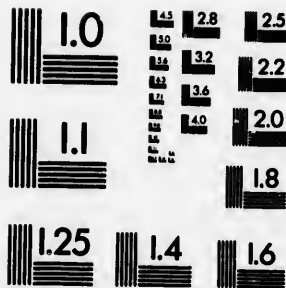
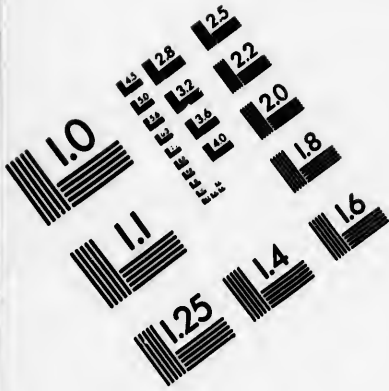


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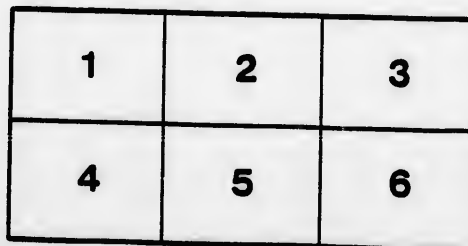
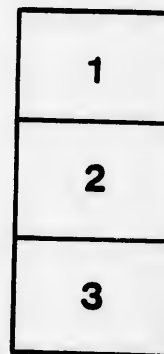
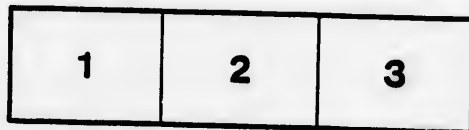
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ONTARIO AGRICULTURAL COLLEGE
EXPERIMENT STATION.

BULLETIN LXXIII

FUNGICIDES AND INSECTICIDES.

BY J. H. PANTON, M.A., PROFESSOR OF NATURAL
HISTORY AND GEOLOGY.

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BULLETIN LXXIII.

FUNGICIDES AND INSECTICIDES.

Of the numerous experiments that are being carried on at Experiment Stations in Canada and the United States none have afforded more definite results than those conducted for the purpose of ascertaining what compounds may be used successfully against such parasitic plants as blights, mildews, rusts and smuts, and against the insects injurious to vegetation.

Although results of these investigations are printed in agricultural and horticultural journals from time to time, yet many Canadian farmers are not fully informed in regard to them. During a late trip in connection with Farmers' Institutes I was surprised that so few had as yet learned anything from this field of investigation.

With a view to reach at least the members of Institutes in Ontario I have put into this Bulletin some practical knowledge upon the results of researches in reference to the use of fungicides and insecticides, and hope it will prove handy for reference when information regarding these is required.

I. FUNGICIDES.

Fungicides may be defined as chemical compounds or mixtures used for the purpose of destroying such injurious forms of plant life as live upon other plants by absorbing their juices to such an extent as to affect their vitality. Examples are seen in the *rusts, smuts, mildews and blights*.

It is but a comparatively short time since the life history of these obscure forms of plant life has been made out; but during late years wonderful strides have been made in this department of biology, and we are now in possession of knowledge that enables us to hold in check their destructive effects by the application of so-called fungicides; among which some of the most important are:

Bordeaux Mixture. This consists of copper sulphate, lime and water in the following proportions: 6 lb. copper sulphate, 4 lb. lime, 22 gals. water. This may be prepared by dissolving the copper compound in 16 gals. water; slake the lime in 6 gals. water, and when the latter is cooled pour it slowly into the copper solution and mix thoroughly. Some use less water for dissolving the first. This solution sprayed has been successful against downy mildew of the grape and potato blight.

A modified form 4 lb. copper sulphate, 4 lb. lime and 50 gals. water has been beneficial upon raspberries affected with Anthracnose.

Eau Celeste. This consists of copper sulphate, ammonia (commercial) and water, 1 lb. copper sulphate, 1½ pints ammonia and 22 gals. water. Dissolve the copper sulphate in about 2 gals. hot water, as soon as cool add the 1½ pints ammonia and dilute to 22 gals.

A modified form has given better results, viz.: 2 lb. copper sulphate dissolved in two gals. water, 2½ lb. sodium carbonate (washing soda) dissolved in another vessel. Mix these, and when chemical action has ceased add 1½ pints of ammonia and dilute to 22 gals. Some dilute even to 30 with good results.

This has been found good against downy mildew of grapes, black rot of grape, anthracnose, blight of potato, rot of the tomato, gooseberry mildew and scab of apple when sprayed upon the affected plants.

Eau Grison (Grison Liquid). This consists of sulphur, lime and water. Boil 3 lb. sulphur and 3 lb. lime in 6 gals. water until reduced to 2 gals. When settled pour off the clear liquid; this may be bottled and when used dilute with 100 parts water. This is used to destroy downy mildew and powdery mildew of the grape and the mildew of the gooseberry.

Copper Sulphate. 1 lb. in 24 gals. water used to destroy smut on seed grain. Soak the seed in this for from 12 to 16 hours; then dip it into lime water for five minutes. The last step is not absolutely necessary, but is an improvement.

**Ammoniacal solution of copper carbonate.* Copper carbonate, ammonia and water. Dissolve 3 oz. copper carbonate in 1 quart ammonia, and when about to use dilute to 22 gals. Some use more water (28 gals.) Used to destroy grape mildew and apple scab. In the latter disease it has been very successful.

Potassium Sulphide. 1 oz. potassium sulphide to 2 gals. water destroys gooseberry mildew and strawberry blight—so-called "Sunburn."

Sodium Hyposulphite. 1 lb. to 10 gals. water used against apple scab, but not so successful as Eau Celeste and the ammoniacal solution of copper carbonate.

II. INSECTICIDES.

Compounds or mixtures used to destroy insects injurious to vegetation.

Paris Green (arsenite of copper containing 50 to 60 per cent. of arsenic). Applied dry or in solution. In the dry form best mixed

*In spraying, to prevent downy mildew of the grape spray ten days before blossoms appear, again as soon as berries are well set, and two or three applications afterwards at intervals of about ten days if needed. To prevent apple scab, spray before blossoms open and also after they have fallen, and if deemed necessary twice at an interval of about ten days.

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with 50 to 100 parts plaster, wood-ashes, flour or air-slacked lime and dusted upon the affected plants. The wet form is usually used in the proportion of 1 lb. Paris green to 200 gals. of water, but if the foliage is tender 250 to 300 gals. water (applies to application upon the plum. As this green powder does not dissolve it requires to be kept thoroughly mixed. It is an excellent insecticide against potato bug, plum curculio, canker worm, tent-caterpillar grape vine beetle and codling moth. It can be used successfully in nearly all cases of leaf-eating insects.

London Purple. An arsenite of lime obtained as a by-product in manufacturing dyes; is largely used instead of Paris green; but being more soluble in water it is likely to injure the foliage, and besides its composition varies considerably so that when used it is not likely to give as uniform results as Paris green.

In spraying for codling moth it is usual to spray after the blossoms fall, when the apples are about the size of peas and before they have turned downwards on the stem, and a second time about ten days after. For plum curculio, as soon as the fruit is formed, followed by two or three applications with an interval of ten days between. In this case the solution is weaker than that used upon the apple, 1 lb. in 250 to 300 gals. of water.

Kerosene Emulsion. A mixture of coal oil and water. There are three mixtures of this kind that are used to a considerable extent:

(a) Riley-Hubbard Emulsion. $\frac{1}{2}$ lb. hard soap in 1 gal. rain water, boil till dissolved, then add 2 gals. coal oil and mix thoroughly for about five minutes. When properly mixed it will adhere to glass without oiliness. In using dilute with 9 parts water (soft).

(b) Cook's Emulsion (soft soap). 1 quart soft soap, 2 quarts boiling water. While hot add 1 pint of coal oil. Mix thoroughly. In using dilute with equal amount of water.

(c) Cook's Emulsion (hard soap). $\frac{1}{2}$ lb hard soap, 2 quarts water and 1 pint coal oil, and thoroughly mix while hot. In using dilute with twice the amount of water.

These emulsions are very excellent against plant lice, scale insects, chinch bug, cabbage-worm and even rose-beetle.

Hellebore. Obtained from the powdered roots of a plant (*Veratrum album*). May be applied dry or as liquid. 1 oz. to 3 gals. water. Excellent against currant worm and cherry slug.

Pyrethrum. Made from the powdered flowers of the genus *pyrethrum*, a plant of the sunflower family. It should be fresh, and hence should be kept in closed vessels. Used in dry form, 1 part pyrethrum, 5 to 8 parts flour; or liquid 1 oz. in 3 gals. water. A good remedy for cabbage worm.

Carbolic Acid Emulsion. 1 part carbolic acid to 5 to 7 parts of a solution consisting of 1 quart soft soap or 1 lb. hard in 2 gals. water. This applied to affected trees destroys bark lice and the borers. It should be well rubbed upon the parts attacked.

Carbolized Plaster. A mixture of carbolic acid and land plaster, 1 pint of the former and 50 lb. of the latter. A remedy against flea beetles.

Tobacco. The refuse from cigar manufactories answers the purpose. A strong solution added to one gallon water destroys plant lice and flea beetles.

Alkaline Wash. A strong solution of washing soda mixed with soft soap until about as thick as paint. Applied to the trunk of trees destroys the borers and gives a healthy vigorous tone to the tree.

III. APPLICATION OF FUNGICIDES AND INSECTICIDES.

The foregoing compounds and mixtures are usually applied by means of spraying machines, many of which are now advertised, and information concerning them be readily obtained from seedsmen or others concerned in their sale. As such are readily accessible to farmers and gardeners it is unnecessary to give the names of manufactures in this Bulletin.

The following list of prices will give the readers an idea of the approximate cost incurred by the use of certain compounds in making up mixtures. Price per lb.:

Ammonia, 25c.; copper carbonate, 60c.; Paris green, 30c.; London purple, 15c.; pyrethrum, 40c.; copper sulphate, 12c.; hellebore, 25c.; sodium carbonate, 5c.

PRECAUTIONS IN SPRAYING, ETC.

1. Keep poisonous substances labelled and out of the way of children.
2. Do not continue to spray so far into the season as to affect the fruit.
3. In making emulsions remember the inflammable nature of coal oil.
4. Never spray trees in bloom.
5. Try mixtures on a small scale if you have any doubts regarding their effect upon the foliage.
6. Be careful and thorough in your work.

Much has been said of late regarding the danger incurred by eating fruit from trees and vines which had been sprayed with Paris green; but careful chemical analysis show there is no ground for such an alarm. In the case of some suspected apples it was found that eight tons would require to be eaten before a dose of poison would be taken.

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