

PESTS AND DISEASES.

FORMULAE OF SOME COMMON INSECTICIDES AND WASHES EMPLOYED AGAINST VARIOUS INSECT PESTS, WITH DIRECTIONS FOR THEIR USE.

The following extract is taken from Bulletin No. 31 of the Department of Agriculture, Mauritius, on "Hints on the General Treatment of Insect Pests in Mauritius" by D. D'Emmerez De Charmoy, *Assistant Director and Entomologist* and A. Moutia, *Scientific Assistant*.

CONTACT INSECTICIDES.

1.—Kerosene Emulsion.

Soap (Ordinary hard soap)	...	...	30 grams.
Kerosene	...	...	1 litre
Water	...	...	$\frac{1}{2}$ litre

Dissolve the soap in boiling water and add the Kerosene gradually, a little at a time, churning violently all the while with a pump or a paddle until a creamy liquid results. For use, dilute one part of emulsion with 20 to 30 parts of water and spray over plants affected. This is specially useful against Aphids and soft bodied scale insects.

2.—Kerosene Emulsion and Creoline.

Prepare a Kerosene emulsion as described above, using:—

Soap (Ordinary hard soap),	...	...	75 grams
Kerosene	...	...	1 litre
Water	...	...	$\frac{1}{2}$ litre

Add $\frac{1}{2}$ litre of Creoline per litre of this emulsion. The mixture thus obtained is employed successfully against Red Ants and is of considerable value against Lawn-cut-worms.

For Red Ants it is used by diluting 1 litre with 50 litres and should be poured slowly in their nests; for Lawn-cut-worm it is employed at the strength of 1 to 2% according to the state of the lawn and its degree of infection. Eight to 10 litres are necessary for 16 square feet of space, and it is better sprayed after sunset and after the lawn has been watered.

3.—Carbon Bisulphide Emulsion.

Mix 20 c.c. of Carbon Bisulphide with 20 c.c. of coconut oil in one container, and dissolve 1 lb. of soap in 20 litres of water in another, then emulsify. This emulsion is intended for use against insects living underground, larvae of moths attacking lawn grass as *Crambus Seychellarum*, against various scale insects and grubs, etc. It owes its effect to the poisonous action of the Carbon di-sulphide which slowly diffuses in the soil.

4.—Tobacco Wash.

One pound of Tobacco refuse is boiled in 9 litres of water for one hour or soaked in cold water for 48 hours. The Wash is then ready for use. It

is employed with much success against Aphids and soft bodied scale insects attacking the root systems of plants, and also against caterpillars attacking fruits and vegetables, when the use of mineral poison is precluded.

5.—*Soap Wash.*

Dissolve one pound of ordinary Soap in 9 litres of water. This solution can be used warm against soft bodied scale insects attacking stems, and cold and diluted against Aphids attacking rose trees and vegetables with fair results.

6.—*Whale Oil Soap.*

This insecticide is used specially against plant-lice, mealy bugs and certain scale insects. It may also be used with success on caterpillars and soft bodied insects.

It is used in solution at various strengths, and is prepared by merely dissolving the soap in water, the usual strength being 50 grams for 1 litre of water.

7.—*Rosin.*

This substance is useful in combating unarmoured scale insects. It is most commonly used in combination with other materials in the form of a wash. The most common Rosin compound is composed of:—

Powdered Rosin	...	...	180 grams
Powdered washing soda	..	...	140 grams

Mix the constituents thoroughly and dissolve by boiling in 500 c. c. of water, adding more water from time to time so as to make 2½ litres. This is the stock solution, and should be of a clear brown colour when cold. For use, add 5 parts of water to 1 of the stock solution.

8.—*Rosin and Oil.*

This insecticide is similar to the preceding one, but contains an oil which has a more penetrating effect. It is composed as follows:

Powdered Rosin	...	...	1 Kg. 250 grams
Caustic Soda	...	...	250 grams
Fish Oil	...	...	250 grams

Mix these materials and cover with about 2 inches of water and boil.

When the liquid is clear add water slowly still boiling the mixture until the whole is made up to 10 litres. This is kept as Stock solution. Dilute 1 part with 7 of water before use.

9. *Rosin and Whale Oil Soap Compound.*

This is a more general insecticide and is useful against unarmoured scales; it consists of:—

Powdered washing soda	...	...	150 grams
Powdered Rosin	...	...	200 grams
Whale Oil Soap	...	...	500 grams

Boil the soda and Rosin in about 500 c. c. water until the whole is dissolved, then add water slowly so as to make 2 litres and continue boiling. Dissolve separately the soap in 2 litres of water by boiling. Mix the two solutions together and keep as a stock solution when required for use, dilute 1 part of solution with 5 parts of water.

10. *Soft Soap and Naphthalene.*

Coconut Oil	...	...	...	300 c.c.
Soft Soap	..	...	...	450 grams
Naphthalene	...	...	...	20 grams

Dissolve the Naphthalene in the Coconut Oil which has been previously melted. Add this mixture to the soft soap, and thoroughly mix the whole by stirring.

A nearly solid substance is produced which is prepared for use by stirring in water. It is used generally at the rate of 1 to 2 lb. in 10 gallons or 45 litres of water. This is a very useful general insecticide and at varying dilutions can be made to answer requirements for dealing with a large range of sucking insects. The fact that it is semi solid greatly enhances its keeping properties and facilitates storage; while it is simple and convenient to use.

11.—*Sulphur.*

Sulphur may be used either dry or as a spray. When used dry it may be dusted by itself or mixed with Lime. When sprayed it is used at the rate of 100 grams of Sulphur for 1 litre of water. It must be applied in the early morning, as its insecticidal action is due to its oxidation under the influence of sunlight.

It has special value in combating mites, ticks, and leaf-blister mites (Sulphur is also applied as an ointment in the case of mange and itch affecting domestic animals).

12.—*Lime-Sulphur.*

This is prepared and used as a spray against various insects affecting the foliage. It is composed of the following:—

Quick Lime	...	...	...	2 lb.
Sulphur	...	...	...	2 lb.
Cold Water	...	...	...	1.5 litres

The quick lime is placed in a barrel or other suitable vessel—(copper vessels must not be used) and the required amount of *cold* water added. As soon as the slaking is well started, sift in the two pounds of sulphur and stir the mixture well.

The heat generated by the slaking of the lime brings about a chemical combination between the lime and the sulphur. More cold water is added until the mass has assumed a pasty consistency, this solution is then diluted to form 45 litres and used for spraying.

STOMACH INSECTICIDES.

Arsenate of Lead.—Arsenate of Lead contains 22% Arsenious Oxide. It comes on the market in the form of a whitish paste and is one of the best Stomach Insecticides. For use it may be employed as follows:—

Commercial Lead Arsenate paste	...	...	...	5 grams
Water	...	...	...	2 litres

The paste is simply diluted in water and the mixture sprayed over the foliage of plants attacked by beetles, caterpillars and other chewing insects. Its use with garden vegetables and fruits is however not possible.

Colloidal Arsenate of Lead.—The formula found to be most satisfactory as given by J. F. Brinley is as follows :—

Lead Nitrate	...	...	331	grams
Disodium Arsenate	...	...	311	grams
Gelatine	...	...	17.4	grams

The Gelatine is mixed with the crystals of Sodium Arsenate and dissolved in a small quantity of hot water. The whole is then diluted to 10 litres. The lead salt is likewise dissolved in hot water and diluted to make 10 litres; the Lead Nitrate is then passed into the solution of Sodium Arsenate and Gelatine, stirring continuously.

The mixture is tested with Potassium Iodide paper to ascertain whether or not the lead salt is in excess, an excess of lead salt is indicated by the paper turning yellow. In that case more solution of disodium arsenate is added. The Arsenate of lead thus formed is a colloid, *i.e.*, it is composed of very fine particles which will remain in suspension for several days. When sprayed upon a leaf it forms a thin film, which is not easily washed off.

Paris Green.—Paris Green is an aceto-arsenate of Copper and is put on the market as a bright green powder.

For use it can be employed as follows :—

Paris Green	...	...	...	5	grams
Lime	...	...	...	10	grams.
Water	...	...	...	10	litres

A paste is made with the Lime and Paris Green, which is diluted in 10 litres of water. The precautions required in using this insecticide are the same as those observed with Arsenate of Lead. The insecticide may be used mixed with Bordeaux mixture when the plants are suffering from fungoid diseases as well as insect attack. In some cases this substance is used dry in the proportion of 1 part of Paris Green to 6 parts of lime by weight. The mixture is applied as a dust distributed from a muslin or an osnaberg bag attached to the end of a rod. It may also be applied by means of some form of powder distributor.

London Purple is Calcium Arsenate coloured with aniline dye and is used in the same way as Paris Green.

Pyrethrum.—This insecticide can be used both as a stomach and contact poison. It is used in the form of spray or wash for killing caterpillars and other soft-bodied insects, and also dusted as a powder.

About 30 grams of the substance is dissolved in 1 litre of hot water and then diluted to make 4 litres before spraying.

A mixture of 1 part of Pyrethrum with 2 parts of flour makes a good stomach poison.

Hellebore.—This substance is obtained from the roots of *Veratrum album*. It is used for the control of soft-bodied slugs and caterpillars on certain plants. Its effects are similar to those of Pyrethrum.

POISON BAIT.

These are employed particularly against insects and other forms of animals which do not pass the whole of their life on the plants which they attack. The principle involved is to spread poisoned material, in places

likely to be visited, composed of substances which are more attractive than the crop which it is desired to protect.

1. Arsenate of Soda	...	1 lb.
Sugar or Molasses	.	2—4 lb.
Water	... ..	16 gallons

This solution is used chiefly against locusts and other chewing insects and is sprayed on crop plants attacked by those insects.

2. Fruit Fly Bait	... Molasses	... 2½ gallons or 11¼ litres
	Arsenate of Soda	... 1 lb. or 450 Kg.
	Water	... 25 gallons or 112½ litres

This is used against fruit flies such as the orange fly, and the Cucurbitacean flies. It is sprayed over the bearing trees and surrounding plants by means of a garden syringe, in such a manner as to get a few drops here and there on the foliage.

CUT WORM BAIT.

1 Sodium Arsenate	... ..	1 lb.
Treacle or Brown Sugar	... ..	8 lb.
Water	... ..	10 gallons

For use, refuse vegetable material such as cabbage, potato, etc., is cut in pieces and soaked in or sprayed with the mixture, and pieces scattered about the infested fields. It may also be used against snails—*Achatina Ponderosa*.

2 Arsenate of lead	... ..	1 lb.
Treacle	... ..	8 lb.
Wheat Bran...	... ..	50 lb.

It is usually spread over the ground in infested fields before planting.

GASEOUS INSECTICIDES.

Carbon Bi-Sulphide.—This substance is ordinarily used against insects attacking stored grains, such as the weevils and the larvae of Tineid moth. It is employed at the rate of 1—1½ lb. per 1,000 cu. feet of space of grains stored in air-tight bins.

Petrol.—This substance can be used in place of Carbon Bi-Sulphide against the same insects under the same conditions.

Hydrocyanic Acid.—The gaseous insecticide most unusually employed is Hydrocyanic Acid; it is prepared by treating potassium Cyanide with Sulphuric Acid, when Hydrocyanic gas is evolved. It is extremely toxic and should only be made use of in special cases as in the treatment of ferns and other plants which are spoiled when treated with oily or powdered substances. In treating plants the following procedure should be observed:

The plant to be treated is placed under an impermeable tent or in an air-tight box in which a small opening has been left to enable one to place the Cyanide in the vessel containing the diluted acid readily.

For a charge, take:—	Potassium Cyanide	... 30 grams
	Sulphuric acid	... 30 c.c.
	Water	... 90 c.c.

Pour the Sulphuric acid into a glazed earthenware vessel ; an evaporating basin answers well. Place the powdered Potassium Cyanide in a muslin bag and when all is ready, drop it into the acid and leave the plant in contact with the insecticide for one hour. The case should be opened in the open air, and in so doing care should be taken not to inhale the gas.

REPELLANTS.

Tobacco dust, and Aloe Juice are sometimes sprayed on ornamental plants to protect their leaves and flowers. Of all repellants Lead Chromate is probably by far the most efficient. A suitable formula is:—

Chromate of Lead	...	...	5 grams
Water	...	...	1 litre

ADHESIVE SUBSTANCES.

In order to render insecticides more adhesive, Wheat Flour or mucilaginous substances such as cactus juice are sometimes employed with excellent results.

To prepare a suitable solution soak 1 lb. of sliced cactus stems in 10 litres of water for 24 hours; filter and add the mucilaginous substance thus obtained to the insecticide.

CONTROL OF HOUSEHOLD INSECTS.

Ants.—Various species of ants frequent houses and are often a source of much trouble. To get rid of them it is necessary to locate the nest ; the latter is then destroyed by pouring kerosene emulsion or any similar insecticide into it. In case the nest cannot be found, the ants may be attracted by means of a sponge or similar absorbent which has been soaked with sweetened arsenical mixture and placed in a tin with a perforated cover. The ants enter the tin through the holes and carry off the poisoned syrup to their nest, thereby poisoning the young brood. A suitable formula for such a sweetened mixture is the following:—

Honey, Syrup or Treacle	...	...	100 grams
Potassium Arsenate	...	...	1 gram

Cockroaches.—Cockroaches are very common in houses. They are specially conspicuous on warm nights, they attack food and clothing and impart their offensive odours to foods and utensils. They can be poisoned by a mixture of Boracic acid with syrup or Molasses, or by a mixture of finely powdered Borax or Sodium Fluoride with flour.

House Flies.—The control of these objectionable insects may be facilitated by the use of the following bait mixtures.

1.....Milk	...	35 c.c.	2	...	Arsenate of Soda	1 lb.
Formalin	...	15 grams		...	Sugar	10 lb.
Water	...	60 c.c		...	Water	10 gallons

No. 1 is to be preferred as it is non-poisonous. The mixture is placed about infested rooms in dishes or in trays.

3.....Fly Papers can be prepared as follows:—Dissolve in 60 c.c. of castor oil or in linseed oil 60 grams of rosin, add a spoonful of honey and boil until the mixture acquires a sticky consistency. The resulting sticky mixture is then spread on sheets of paper.

4.....Cattle-Fly Repellant. For repelling flies from cattle, horses and mules the following may be used:—

Fish Oil	...	...	...	4 litres
Tar	...	...	...	60 c.c.
Kerosene	...	...	...	500 c.c.

The mixture is lightly smeared over the limbs and back of the animal.

Silver Fish.— (*Lepisma*) This insect infests books and papers and often prove very destructive. Books may be protected from their attacks by applying to the cloth-binding, the following mixture:—

Corrosive Sublimate	...	...	1 oz.
Carbolic acid	...	...	1 oz.
Methylated Spirit	...	...	+ oz.

The mixture should be painted on with a broad flat camel hair brush and should not be allowed to come in contact with the hands.

A RHIZOCTONIA DISEASE OF VIGNA.

BY JOHANNES GANDRUP, Mag. Sci.

Translated from the Dutch, by H. L. Ludowyk, Librarian, Agric. Dept.*

In 1922, I discovered on a plot of *Vigna oligosperma*† in the Coffee Garden of the Experiment Station, some patches on which the plants were infected by a disease which totally destroyed the leaves. The patches were not large—about a metre in diameter. The disease had then just appeared, and its first appearance was noticed after some heavy showers. Soon after the disease had attracted my attention, it was found in other places; and the same disease symptoms were observed later on several estates. The disease then prevailed right to the end of the rainy season, at which time it disappeared and the plants began to recover. As the disease reappeared with the first showers of the rainy season, and it appeared that, on some estates, the infected areas were large—some 10 sq. metres—it seemed worth the trouble to investigate the disease more closely. In the following pages this investigation is briefly described.

THE DISEASE SYMPTOMS.

The character of the disease varies somewhat according to the degree of dampness. During heavy rains the disease may occur at once over a fairly wide area on which the leaves appear as though hot water had been poured over them. The leaf tissue becomes a slimy mass that cannot be lifted without breaking the leaves. This slimy mass has a green colour, somewhat darker than the colour of a healthy *Vigna* leaf. The shape of the leaves is still quite apparent. As soon as the drought commences, the dead leaves dry up and form a very thin and brittle layer which either lies flat on the ground or hangs on the surviving leaves and branches. The colour of this residual of leaves is yellowish to gray. When the leaves are killed at once through quickly spreading infection, the slimy consistency comes more

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† The proper name is *Vigna Hosei* (Craib) Backer. Since the plant is known to planters by the name of *Vigna oligosperma*, we have used this name so as to prevent confusion.