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Grapevine Diseases and their Control

by

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Grapevine is cultivated in a number of districts in this state. Madura leads in the acreage and the vines are grown in a number of taluks of this district. Outside Madura district, grapevine cultivation is prevalent to a limited extent in Tirunelvely, Tiruchirapally, Coimbatore, Salem and S. Arcot districts. The total acreage in this state may not exceed 500 acres. The variety commonly cultivated is known as "*Pachai dhrakshi*" in Tamil. Some growers however have introduced the seedless Australian varieties. 'Blackprince' and another purple fruited variety are also grown to some extent. This crop is highly remunerative but needs careful attention in pruning and in the control of the diseases which form the limiting factors in the successful production of the fruits. The chief diseases affecting the crop and the methods of controlling them are described in the following pages.

Downy mildew: This disease is caused by the fungus *Plasmopara viticola* (Berk. & Curt.) Berl. & de Toni, which is an obligate parasite. It has been recorded from all countries where grapevine is cultivated and is one of the most serious diseases attacking this crop. In this state also it has been noticed in all the districts where the vine is grown. It occurs during the rainy season and when there is heavy fall of dew. During the summer months however it is not prevalent. Under favourable weather conditions it spreads very rapidly and may destroy the entire crop in a short period.

The fungus infects the leaves causing yellowish irregular spots on the upper surface. On the corresponding lower surface a white downy growth made up of the conidiophores and conidia of the fungus develops. The fungus mycelium itself is internal and spreads inside the affected tissue. The name of the disease is derived from the appearance of the growth of the fungus on the surface. The conidia are disseminated easily by wind. The large number of conidia produced by this fungus is responsible for the rapid spread of this disease. These conidia germinate under humid conditions and cause fresh infection. Many of the leaves become infected and the disease spreads to the young shoots causing their eventual drying up. The affected portions of the leaves turn brown and defoliation occurs. In one week the disease may spread throughout the garden. Besides affecting the leaves and stem, young inflorescences and fruit bunches are also invaded resulting in their shrivelling and drying. When half ripe fruits are infected they shrivel up completely and all the berries in the bunch turn brown and leathery. Considerable loss of the crop is caused and in some seasons the entire crop may be destroyed. (Plate I, Figs. 1, 2, 3).

The oospores (perfect state) of this fungus have not been observed in this state. The survival of the disease from season to season is brought about by the persistence of the fungus in the vines, which are left unpruned or which are pruned at varying periods. Even in the vines which are pruned at the same time, the fungus persists as dormant mycelium in the buds or the shoots.

Control: The control of this disease depends on the strict observance of plant sanitation methods and protection of the vulnerable parts of the vines at critical periods. For this purpose a regular schedule of operations has to be followed. Some growers leave the vines which are infected without pruning while other vines nearby are pruned. Other growers stagger their pruning operations so that the vines in all stages of growth are found in the same garden. These are conducive to the continuance of the disease as the unpruned vines will form a ready source of infection to the new shoots that grow out of the pruned ones.

As soon as the vines are pruned it is advisable to wash the stem and branches with one per cent Bordeaux mixture so that the pathogen on the surface may be destroyed. All the prunings are to be destroyed and should not be allowed to remain in the garden. The new shoots that grow out will need protection and this can be achieved by spraying them with the same fungicide about 3 to 4 weeks after pruning. The young shoots may be adversely affected in some varieties by the use of one per cent Bordeaux mixture. In such cases it is desirable that the strength of the mixture is reduced to 3:3:50. A third spraying will be necessary before the opening of the flower buds. After the fruit set, the young bunches are again to be protected by spraying one per cent Bordeaux mixture. Depending upon the weather conditions one or more further sprayings may be necessary to protect the growing bunches. At Pattiveerampatty, in some seasons the vines have received as many as eighteen sprayings during one season. During the course of the trials conducted at Ganguvarpatty it was found that 'Cupravit ob 21' at the rate of 1 lb. in 25 gallons of water was also effective in controlling this disease. There is no need to add adhesives like soda and resin or casein to the fungicides as the rainfall in these areas is not heavy enough to wash away the fungicides. During the trials no adhesives were added to either Bordeaux mixture or Cupravit and the disease was completely kept in check. The addition of resin and soda as adhesive as practised by some of the growers in Madura district actually resulted in the infestation of the bunches by mealy bugs. It has been reported that vines which are not adequately supplied with nitrogenous manures are more readily affected by the downy mildew and therefore it appears that application of adequate quantities of nitrogenous manures in the beginning of the season will be useful in invigorating the vines and reducing the damage caused by this disease.

Powdery Mildew: This disease is also widespread being prevalent all over the world. It is caused by the fungus *Uncinula necator* (Schw.) Burr. This fungus produces a powdery white growth on both sides of the leaves and on young shoots. This is made up of the mycelium and the conidia of the fungus. The growth is external but haustoria are sent into the epidermal cells to obtain nourishment. As a result of infection, the leaves may turn pale and sometimes they curl up and are shed. Infection of the flowers results in their destruction and prevention of fruit set. The fungus infects the berries also enveloping them with a white powdery coating and causing them to crack and fall before they mature. Under humid conditions the cracked fruits are easily invaded by other saprophytic fungi which help in the destruction of these berries. Dark specks may develop on the rind of the berries at the infection spots when the disease is mild. This disease occurs more during the drier months when warm sultry conditions prevail and the sky is overcast. In some years it causes heavy damage. In America and Europe the fungus causing the disease has been known to produce the imperfect (conidial) state and the perfect (perithecial) state. The perithecia contain asci and ascospores and appear as dark brown dots in the mildew growth. They help in the survival of the fungus from year to year. But in this state the perfect state has not been observed so far. The fungus survives as dormant mycelium on the shoots or in the buds from one season to another. (Plate I, Figs. 4, 5).

Control: Powdery mildew is easily controlled by dusting finely powdered sulphur on the leaves and fruits. Since the disease is prevalent only during the drier season, dusting of sulphur will be necessary for the fruits developing during this period. Though Bordeaux mixture spray will be efficient in controlling the mildew on the leaves it has been the experience that for the protection of the bunches against this disease, sulphur is more effective. Further this fungicide controls also thrips damage to the fruits. Vines must not be over crowded and thinning of leaves may be helpful in improving ventilation and thus avoiding conditions favourable for the spread of the disease.

Anthracnose: This disease is prevalent in Madura and Salem districts especially on the 'Pachai drakshi'. It is caused by the fungus *Elsinoe ampelina* Shear. The imperfect state of the fungus (*Sphaeloma ampelinum* de Bary—*Gloeosporium ampelophagum* (Pass.) Sacc. has been observed in this state. Depressed cankers are formed on the stem and twigs. The growth of the young infected twigs becomes arrested and they remain short, eventually drying up. Brown spots with dark coloured margin develop on the leaves. Severe damage is caused to the berries on which circular brown sunken spots with dark brown margin develop. Based on the appearance of the spots on the berries the disease is commonly known as 'bird's eye disease'. One or more spots

may form on each berry. The berries later shrivel and dry up. Entire vineyards may be damaged. The fructifications of the imperfect state of the fungus appear on the spots as minute raised dots. (Plate II, Figs. 3, 4, 5).

The pathogen survives in the cankers on the stem and causes fresh infection of the new shoots and berries. The damage caused by the disease is very severe in Krishnagiri where the growers do not usually adopt any control measures. Grapevine cultivation in this tract is dwindling on this account.

Control: It is very difficult to keep this disease in check unless the methods of control are adopted in a systematic manner. It has been stated earlier that the fungus survives in the cankers on the stem. All diseased twigs are to be removed. Some old cankers on the main stems may escape detection and may serve as sources of infection. These should be inactivated. For this purpose when the vines are pruned, the stem should be painted with a solution of ferrous sulphate in commercial sulphuric acid (5 pounds of ferrous sulphate, half pint of sulphuric acid in one gallon of water). This should be carefully handled. The prunings should be burnt or buried deep in the soil so that the fungal spores from these may not infect the new shoots. Further, the new shoots and the young bunches should be protected by repeated sprayings of one percent Bordeaux mixture at intervals of 2 to 3 weeks depending on the weather conditions.

Black rot: This disease has been observed in recent years in Madura district. It is severe on certain purple varieties and is less common on the seedless Australian or 'Pachai drakshai' varieties. It is caused by the fungus *Guignardia bidwellii* (Ell.) Viala & Rav. In Madura district, the infection is more on the berries. The symptoms appear usually when the berries are half mature. Circular spots develop on the berries and minute black dot-like pycnidia are formed in these areas. With great rapidity the disease spreads. The berries shrink in size and get darkened. Whole bunches become readily affected. (Plate II, Fig. 1, 2).

Control: This disease is prevalent in most of vine growing countries of the world. It was not recorded from this State till now and therefore must be considered to have been recently introduced into the country. Since the damage occurs on the maturing bunches it is necessary that these should be protected against infection from the time of fruit set. Bordeaux mixture has been found to be very efficient in controlling this disease. One or more sprayings on the young bunches will prevent infection. But this fungicide may leave deposits on the berries when sprayed on maturing bunches and thus reduce their

commercial value. Other copper fungicides like 'Cupravit ob 21' may be used with good effect. These do not leave any visible deposit and can always be used for spraying the bunches.

Rust: Rust of vine caused by *Phakopsora vitis* Syd. has been recorded only from Salem, Nilgiris and Coimbatore districts. It is usually confined to the variety 'Black prince'. Besides infecting the cultivated vines the same fungus has been observed on some of the wild relatives like *Vitis* sp. *Ampelocissus arnottiana* Planch and *Cissus* sp.

The fungus produces numerous orange coloured sori on the lower surface of the leaves. In severe cases of infection the entire leaf surface is covered by the sori. Defoliation also takes place. The uredial state alone has been observed in this state. The disease is common during the colder months of the year (November to February).

Control: Repeated dustings with finely powdered sulphur have resulted in keeping the disease under check. Since the rust is confined to one variety only it will be necessary to adopt this treatment to that variety alone.

Brown Leaf Spot: This is a minor disease caused by *Cercospora viticola* (Ces.) Sacc. and is prevalent usually in neglected vineyards during the months of July to December. Dark brown angular spots are formed on the leaves and young shoots. The clusters of conidiophores and conidia appear as black dots on the spots. In some instances the young shoots dry up as a result of the infection. High humidity favours the spread of the disease. The perfect stage of the pathogen has been observed in America and is named as *Mycosphaerella personata* Higgins. This has not however been recorded in this state.

Control: Proper manuring will result in the vigorous growth of the vines and such vines are not usually infected. The protective spraying with copper fungicides recommended for the control of the other diseases will prevent this disease also. As a matter of fact the disease has not been observed in vineyards receiving the normal spray schedule.

General: It has been the experience in this state that one or more of the above mentioned diseases affect the vines at the same time and therefore a comprehensive method of treatment will have to be adopted in controlling them all. Based on the results obtained in the different districts the following schedule has been drawn up for adoption in the areas where anthracnose and mildews are prevalent at the same time.

1. *On pruning:* Swab the stem with the solution of ferrous sulphate in sulphuric acid. This need not be done in areas where anthracnose is not prevalent but may be substituted by Bordeaux mixture

wash. The cut ends of the vines are to be protected by painting with Bordeaux paste.

2. *Two to three weeks later*: Spray 3:3:50 Bordeaux mixture or Cupravit ob 21. Complete coverage of the leaves and shoots should be aimed at. Unprotected areas will serve as places of entry of the pathogen. Some varieties of grapes are scorched by the use of one per cent Bordeaux mixture at this stage. Therefore a weaker mixture (3:3:50) is recommended for use at this stage.

3. *Before flower opening*: Spray Bordeaux mixture one per cent (5:5:50) or Cupravit ob 21. In case the weather is dry, sulphur dusting may be carried out. Never spray or dust when the flowers are open.

4. *After fruit set*: Spray one per cent Bordeaux mixture or Cupravit ob 21.

5. *On young bunches*: Dust sulphur if the weather is dry. Under humid conditions spray Bordeaux mixture or Cupravit ob 21. One dusting with sulphur on very young bunches is always beneficial.

The necessity for further sprayings will depend upon the weather conditions. If humid weather persists or heavy dews or rains are prevalent or forecasted further spraying of the bunches and shoots will be necessary.

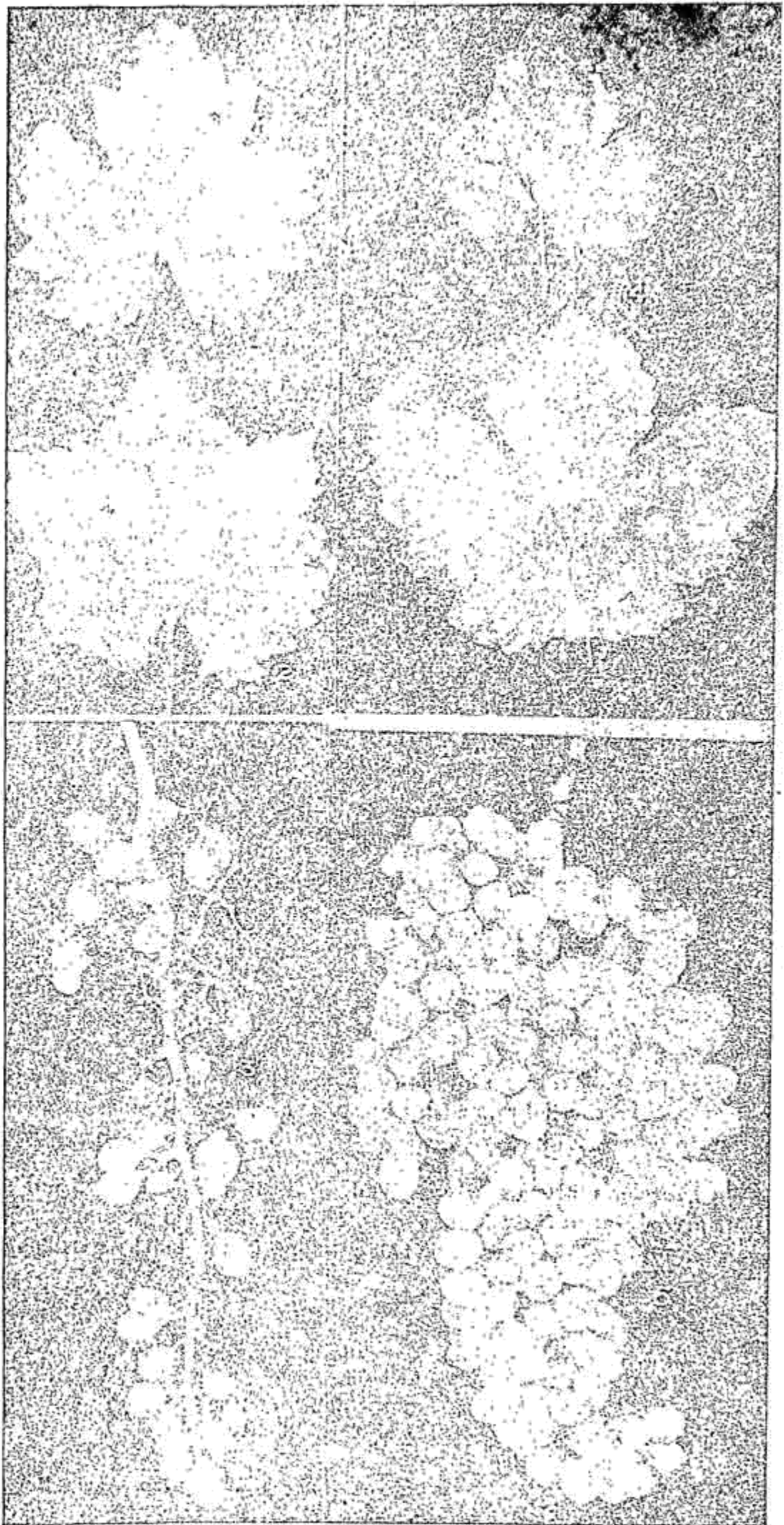
All prunings of diseased materials should be carefully collected and destroyed either by burning or by deep burial in the soil.

Sometimes yellowish mottling of the leaves is observed. This is a sign of lack of availability of zinc salts to the vines. It may be rectified by mixing 1 to 2 lb. of zinc sulphate in 50 gallons of Bordeaux mixture or other copper fungicides used for spraying the foliage. Bordeaux mixture spray in the later stages when the bunches are maturing may leave stains on the fruits and thus affect their market value. Later sprayings may be carried out with Cupravit ob 21 which does not leave a visible stain on the fruits.

The diseases are usually spread to new plantations through the dormant mycelium in the cuttings selected from diseased gardens. Therefore care should be taken to select the cuttings from healthy gardens.

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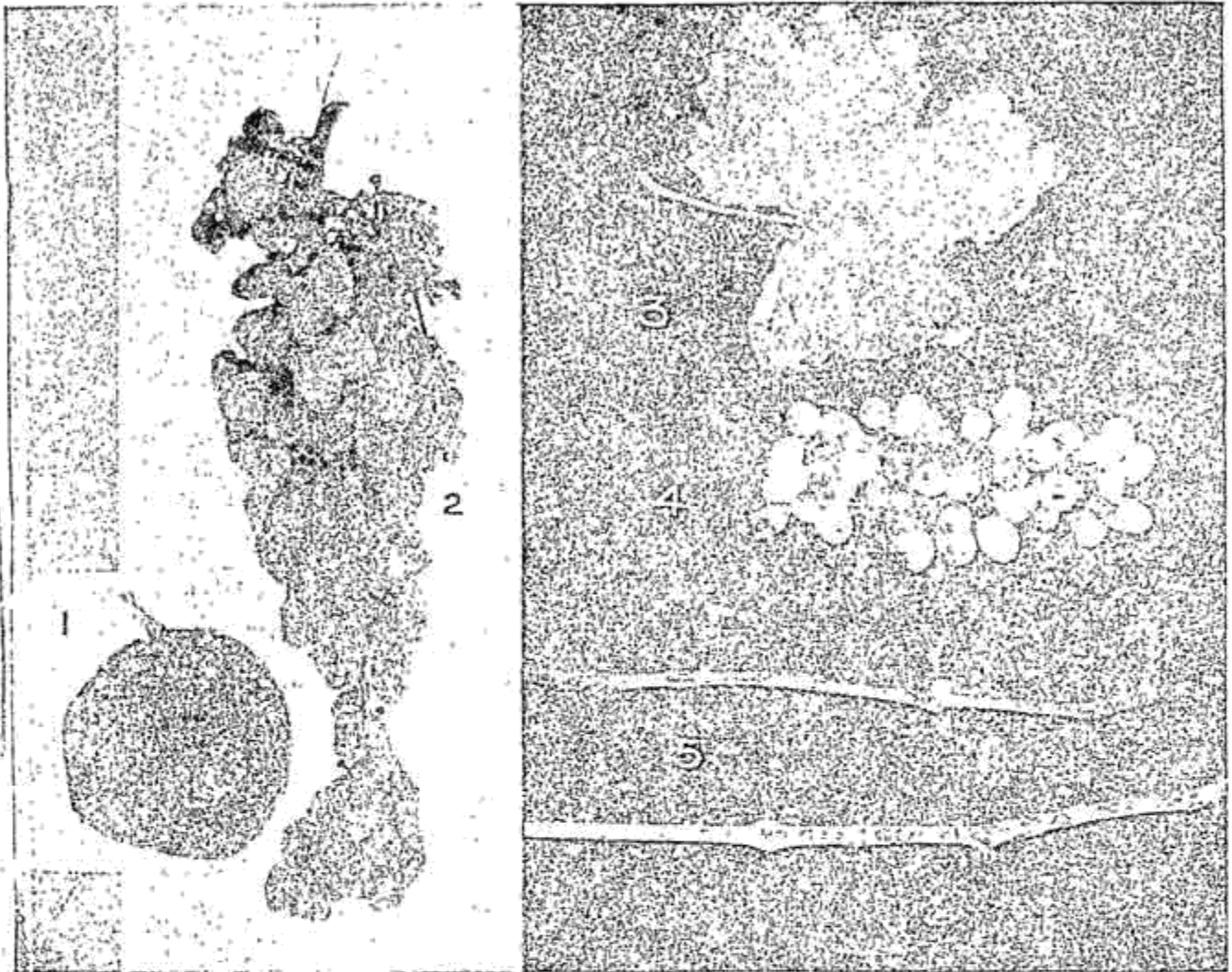


PLATE II

EXPLANATION OF PLATES

PLATE I. Figs. 1 — 3: *Downy mildew*: (1) Upper surface of an infected leaf, (2) lower surface of an infected leaf showing the downy growth of the fungus, and (3) an infected bunch.

Figs. 4 & 5: *Powdery mildew*: (4) Infected leaves, and (5) an infected bunch.

PLATE II. Figs. 1 & 2: *Black rot*: (1) An individual infected berry showing the pycnidia (enlarged), and (2) an infected bunch.

Figs. 3 — 5: *Anthracnose*: (3) An infected leaf showing the spots, (4) an infected bunch, and (5) severely affected canes.