POWDERY MILDEW OF BETEL VINES

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Of recent years powdery mildew has been doing much damage to betel vines grown at Bassein and Kelva Mahim, near Bombay, but it has not been reported from other parts of the Province where this crop is also extensively cultivated. It makes its appearance in the cold season and almost disappears as the hot weather approaches. Older plantations are more liable to attack than newly established gardens.

The disease is caused by a species of *Oidium*, which was first reported from Ceylon by Stevenson (1926), and later by Mitra (1930) from Burma and by Narasimhan (1933) from Mysore. The causative fungus, however, has not been described, and in the following pages a short account of the organism and the disease caused by it, is given.

Symptoms

The disease is easily recognised by the appearance of yellow spots which are slightly raised and irregular in outline and correspond in extent to white powdery patches of mildew on the under-surface of the leaves. These patches are also sometimes found on the upper surface of the leaves. They are at first small but increase in extent as they grow together. They vary in diameter from a few mm. to 40 mm., and are covered with sparse and dusty growth of the fungus. In severe attacks, the patches are covered with fairly thick growth, and are then greyish in appearance. Young leaves, if severely attacked, cease to grow and are often deformed. The surface of diseased leaves is cracked, and their margins are turned in. Such leaves are pale and hard looking, and drop down at the slightest touch. No other part of the vine is attacked.

Morphology of the Fungus

The vegetative mycelium of the fungus is superficial and consists of delicate, white, septate hyphæ, frequently branched and more or less densely interwoven. The hyphæ are 5 to 8·2 μ wide, and from their under-surface arise slender tubes which at once pierce the cuticle and, after entry into the interior of the epidermal cells, swell into globular sacs, the haustoria (Fig. 1,A).

Appressoria also develop from the hyphæ at points where the latter are closely applied to the surface of the leaf, and function as holdfasts (Fig. 1, E).

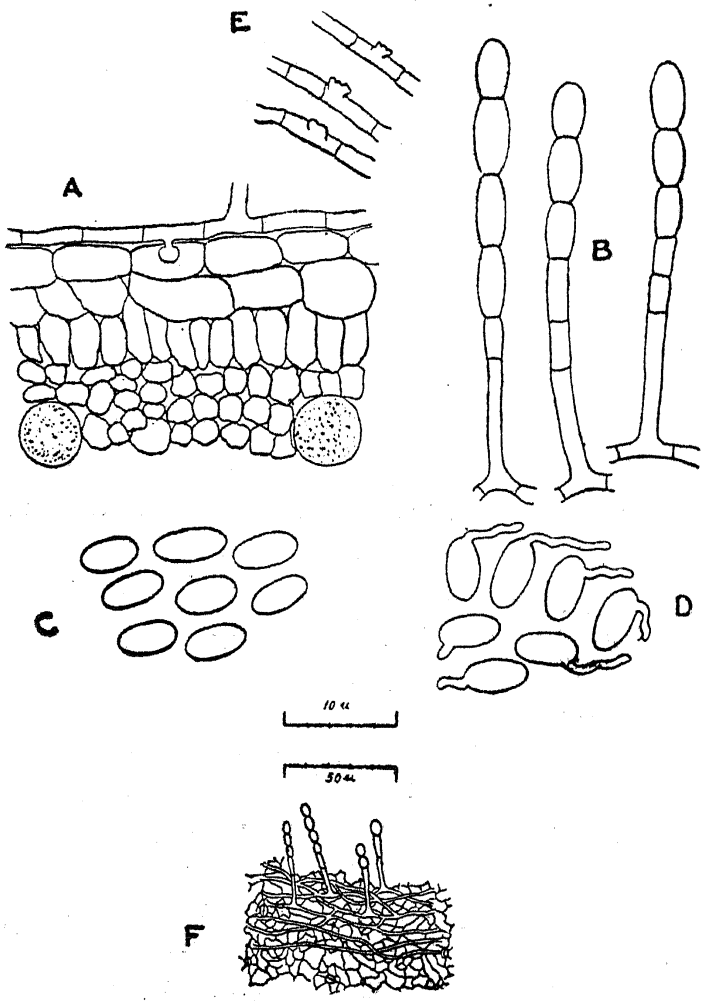

FIG. 1. *A*. Transverse section of an infected leaf showing a globular haustorium. *B*. Conidiophores bearing elliptical conidia in chains. *C*. Conidia showing the range of shapes and sizes. *D*. Germinating conidia. E. Appressoria on the under-surface of superficial hyphæ (A–E × 280). *F*. Portion of a leaf showing septate mycelium, forming a tangled web of much branched hyphæ; conidiophores and conidia (× 56).

After the fungus is well established on the leaf, the prostrate, superficial mycelium gives rise to conidiophores which are erect, simple and usually 2–3 septate (Fig. 1, B and F). These measure 66 to 132 μ long, and bear on their ends conidia in chains of 3 to 10 in basipetal succession (Fig. 1, B and F). The conidia are unicellular, colourless and elliptical or barrel-shaped, and measure 20·4–74·7 × 6·8–23·8 μ (Fig. 1, C). It will be seen from Table I that, although widely differing lengths of conidia are encountered, a vast majority of them fall between 34 and 47·5 μ. The range

of variation in width, however, is not large as about 80 per cent. of conidia fall in the classes between 13·7 and 20·4 μ.

TABLE I

Summarised measurements of conidia of Oidium *on* Piper betel

Classes in μ	Length Number of conidia in 400	Classes in μ	Width Number of conidia in 400
20 to 26·9	21	6·8 to 10·2	1
27 to 33·9	68	10·3 to 13·6	80
34 to 40·9	134	13·7 to 17·0	152
41 to 47·9	147	17·1 to 20·4	167
48 to 54·9	14		
55 to 61·9	11		
62 to 68·9	4		
69 to 75·9	1		

Conidia are produced in large numbers and freely germinate by protrusion of a germ tube (Fig. 1, D). These are short-lived and lose their power of germination if exposed to hot, dry conditions. In the cold season, the climatic conditions are very favourable so that conidia are shed in abundance and are freely disseminated to adjacent healthy plants. Under such conditions, powdery mildew spreads rapidly and is very destructive. At the approach of the hot weather, the growth of the fungus is arrested, and the mildew practically ceases to exist.

CONTROL

As an ectophyte, powdery mildew of the betel vine is amenable to treatment with finely powdered sulphur. Beginning with 1934–35 season, extensive trials on control of mildew were carried out for four years at Bassein and Kelva Mahim in Thana district. Superfine sulphur of the order of 325 mesh fineness was used in these tests and was applied to the vines with a crank duster. Results of these trials show that the number of dust applications and the total dressing per acre vary with the age of the plantation. In newly established gardens about 3 to 6 months old, a single dusting of sulphur at the rate of 25 to 30 lb. per acre given about the middle of December gave complete protection from mildew. In older plantations varying in age from 12 to 24 months, however, two applications of dust were necessary to control the disease, and the best results were obtained when the second application was made about three weeks after the first, *i.e.*, early in the second week of January. The quantity of sulphur dust required to cover an acre of the crop in two operations varied from 70 to 85 lb.

The dusted leaves are quite normal and do not suffer from any ill-effects. In the absence of the treatment, however, it often becomes necessary to pluck the leaves from the vines before they are fully mature as otherwise they are disfigured by spots and fall to the ground if infection is severe. Sulphur dusting thus not only affords complete protection from the disease but has the effect of prolonging the life of the leaves which can be harvested to suit the market requirements.

Diagnosis

The perithecial phase of the fungus has not been encountered, and accordingly, it is proposed to establish it as a species of ***Oidium*** with the diagnosis as follows:—

Oidium piperis, spec. nov.—Mycelium superficiale, ramosum, hyalinum, septatum, 5–8·2 μ diam., efformans sparsum vel crassum integumentum in inferiore facie foliorum; haustoria globosa. Conidiophori erecti, simplices, ut plurimum bis vel ter septati, longitudine 66–132 μ. Conidia unicellularia, hyalina, elliptica vel doliaria, 20·4–74·7 × 6·8–23·8 μ, saepissime 34–47·5 × 13·7–20·4 μ, catenulatim disposita 3–10, germinatia tubo producto.

In foliis viventibus Piperis betle L. in loco Bassein, in distr. Thana, Bombay, India.

Typus positus in Herb. Colleg. Agricult., Poona, atque in Herb. Mycol. Instit., Kew, in Anglia.

Mycelium superficial, branched, hyaline, septate, 5 to 8·2 μ in diameter, forming sparse or thick coating on under-surface of leaves, haustoria globular. Conidiophores erect, simple, usually 2–3 septate, ranging from 66 to 132 μ in length. Conidia unicellular, hyaline, elliptical or barrel-shaped, extremes ranging from 20·4 to 74·7 μ in length and 6·8 to 23·8 μ in width, mostly 34 to 47·5 × 13·7 to 20·4 μ, borne in chains of 3 to 10, germinating by a tube.

On living leaves of *Piper betle* L. at Bassein in Thana District, Bombay, India.

Type specimen deposited in Herb. College of Agriculture, Poona, and Herb. Mycol. Inst., Kew, England.

Summary

The fungus causing powdery mildew of betel vines is described as a new species of *Oidium*. The symptoms of the disease, which is localised at

Bassein and Kelva Mahim in Thana District of Bombay Province, are described. Powdery mildew can be easily checked by dusting betel vines with finely powdered sulphur.

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