Ceriospora Arecae Menon *sp. novo.*

PAPER I.

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In most of the arecanut palms affected by the yellow leaf disease, in the advanced stages of attack, the chlorotic leaves dry up, wither from tip to the base of the leaflet progressively. Various fungi attack the yellowed leaves; the spores germinate, produce hyphal branches which fill up the intercellular spaces of the host leaves and later pass into the intra-cellular cavities. Mature perithecia are produced when the leaves are dried, in large numbers aggregated in the necrotic spots. On examination of the diseased leaves a number of new fungi have been identified and isolated. Of these, the most common to occur in all the leaflets of areca, collected from different parts of Kerala State, is *Ceriospora arecae*.

The genus is characterised by depressed fruit bodies growing under the periderm; it has been observed on Chaemerops humilis and date palm. It has been first described by Niessel in 1876, species *C. dubeyi*; later by Saccardo *Ceriospora bicalcarata*; it is described as *Scolicodothis phoenicis* by Chona and Munjal in Ind-Phytopath and as *Lejosphaerella phoenicis* by Muller and Ahmad in Biologia.

Symptoms. In the early stages, attack begins on yellow leaves; spores germinate and produce hyaline, thin walled 1·5 – 2 hyphae; these spread in the host tissues profusely. Perithecia are found to occur in June-July on the upper surface of the leaves.

In the dried parts of the spots, where the perithecia occur are clearly differentiated from the surrounding host tissues by dead white areas while the other parts are yellow in colour. The fruit bodies are segregated in these areas.

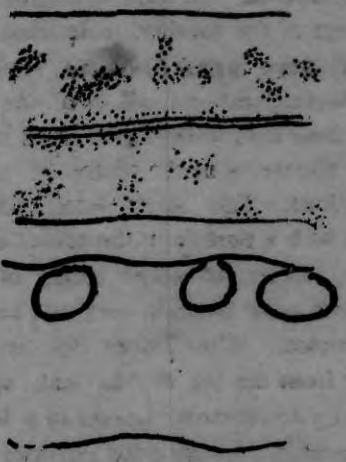

Fig. 1

Perithesia. These are elongated to round with a central depression visible under a hand lens. They are separate, innate to semi-erumpent, not beaked, without clypeus, glabrous, paraphyses evanescent, not seen under stained preparations 46-70x52-70Mue.

Asci. Cylindrical to ellipsoid, 30–58 x 4·6 – 6 Mue.

Fig. 3

Ascospores. Two celled, septum in the middle, distichous to twisted in some cases, 12–14 x 3–4 Mue, hyaline to very light yellow en masse; 20-22x3-4Mue; appendages present at each end of the spore, hyaline; granules occur in most cases massed together in the form of false septae.

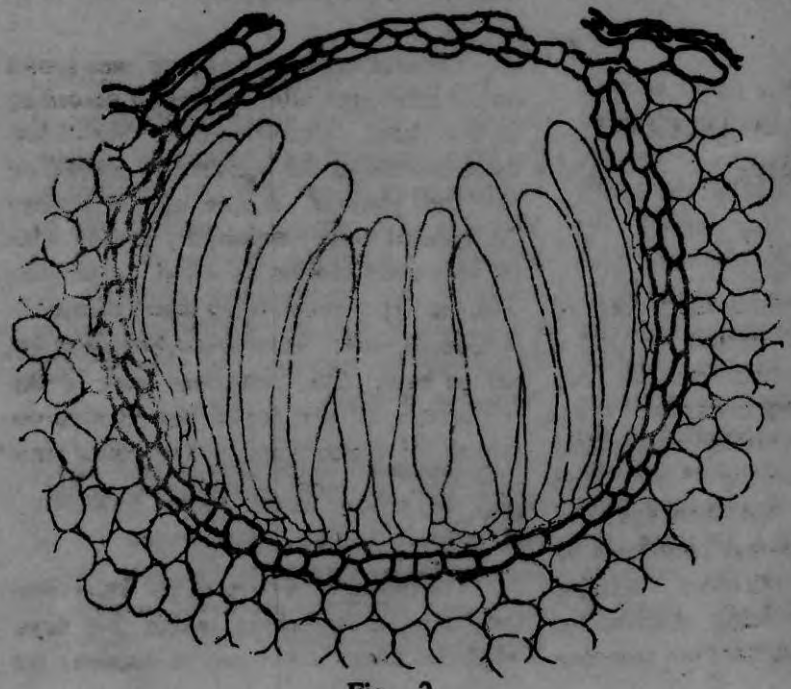

Fig. 2

Fig. 4

CERIOSPORA ARECAE MENON.

Maculae amphiginae; perithecia dispersa, immersa, carbonacea, pariete peritheciorum membranaceo, 2–3 stratis cellularum hyalinarum, fortiter compressarum formata; asci ellipsoidei, vel cylindracei, 8-spori; sporiu hyalinae, ellipsoidae, vel aoutoidae, setosae, setae acrogenae, bicellulare; granulosae.

Hab. in foli is emortins Areca catechu – India,

Kerala, Peringamala (Malamar Estate, Trivandrum District).

Vidura, Trivandrum District.

Further studies with isolation and inoculation are in progress.

Figure 1. Leaflet showing perithecia. Natural size.

Figure 2. Perithecium. x 500

Figure 3. Asci. x 500

Figure 4. Ascospores. x 500

SEEDLING BLIGHT IN ARECANUT NURSERIES.

Radha Menon, R.A.R.S. Palode

PAPER II.

In the seedlings grown at the nursery of the Regional Research Station, Palode, a fungal disease in an epidemic form has been noted. The causal organism has been identified and isolated. Inoculation experiments with the fungus in culture have been tried on healthy seedlings of the same age as of the diseased ones. Sprayings conducted by Sersan, Kriti Copper, Microcop, wettable sulphur and folidol are being observed for effectiveness. The disease has been recorded in the arecanut nurseries of local farmers and also in the Agricultural College Farm, Trivandrum.

Symptoms. In the 6-7 month year old seedlings of the locality, colourless, water-soaked areas appear in the younger and older leaves, scattered all over the lamina. Later these turn yellow with small black pin pricks appearing in the centre of these discolorations. The spots later, turn dark brown with a pustule in the centre of lighter colour. In the advanced stages of attack, the spots grow large, in very rare cases tend to coalesce. The tissues dry up, wither mostly from the tip of the leaf, spreading gradually downwards. Leaves in a few cases are shredded. In the dried portions minute, black, pycnia appear segregated in the spots in the initial attack, spreading on the entire lamina in further stages. The pycnia appear on the upper surface, as black, shining globular bodies, releasing numerous small, hyaline, ovoid pycnospors.

Cultural studies. The fungus was grown on oat meal agar after isolating it according to the tissue culture method. Bits of leaf tissue containing the pycnia were planted on petri dish plates of oat meal agar in a ring; the diseased tissue was initially treated with 1% Mercuric Chloride to avoid contamination, for five minutes and washed throughly in running water, later in distilled water for half an hour. The plate was kept in the refrigerator at 4°c for a day to suppress growth of contaminates. The plates were then kept at room temperature under a bell jar.

The inoculum is covered by white cottony tufts of mycelium within 2–3 days; when the colony is 4–5 mm. in diameter the

mycelial tufts show a tendency for concentric zonation. Whether this peculiarity of growth is found only on oat meal agar could not be conclusively proved due to lack of malt agar medium (malt extract was not available anywhere locally). The hyphae are hyaline, white cottony towards the fringe of the grown region but in the older portions towards the inoculum the hyphae form a wooly felt closely adpressed to the medium turning creamy white in colour. Pycnia occur in large masses towards the older portions of the colony conforming in all cases to the natural ones on the host plant.

Aerial Mycelium. 1.5-2 Mue in diameter, septate, septa occuring at unequal distances hyaline; granular in the initial stages of growth. A number of chlamydospores occur mostly inter calary 2-2.54 Mue in diameter. Onidia were not observed.

Submerged Mycelium. 0.5 – 1 in diameter, separate at long intervals; secondary branches few in number. No chlamydospores.

Pycnia. Scattered, conforming to those in nature, globular, parenchymatous, dark brown in colour, pycnospores ovoid to cylindrical, hyaline, minute.

Inoculation experiments The experiments conducted at the station were limited by lack of laboratory facilities on the spot. 25 pots of medium size were filled with gravel and clayey laterite soil of the station and seedling plants of 7 months were planted in them. The pots were kept in a thatched shed due to the lack of a glass house. After two weeks the seedlings were inoculated with cultures of the fungus isolated on oat meal agar.

Inoculation was conducted as follows:— Pieces of mycelium along with the basel media were implanted on both sides of the leaves, after bruising the bulbiform cells of the lamina. Continuous wetting for 24 hours was effected by spraying with a bucket sprayer and turning the nozzle to the top to stmulate light rain fall. The experiment was further favoured by continuous rainfall for more than a day, ensuring a humid atmosphere.

A pycnial suspension was again made in distilled water and sprayed on the foliage using a hand sprayer. Observations were taken every three days. Disease symptoms and production of pycnia appeared on two plants Experiment is being repeated in the cold weather as it has not been possible to control the temperature otherwise.

Spraying trials Microcop and Bordeaux Mixture sprayed on the affected plants did not produce any effect. In the case of Kriticopper some effect has been noted. It has been seen that top dressing of the seedlings in the form of Ammonium Sulphate and spraying with Kriticopper serves to decrease the virulence of the attack.

It is noteworthy that the attack by this fungus is found on seedlings which are unhealthy due to exposure to sun and where the soil is lacking in Nitrates and Phosphorous. No disease is observed on seedlings which have enough shade and manuring.

SOFT ROTS ON THE ARECANUTS

PAPER III.

It has been noted during the survey in connection with the yellow leaf disease that besides "*Mahali*', the ripe nuts are affected by other organisms which cause soft rot. Material has been collected from Ponmudi and Palode from the arecanut gardens.

1 Dimerosporina arecae Menon Sp. novo.

Symptoms. This fungus attacks the nuts alone either in combination with Phytophthora or alone. The nuts are wrinkled, with numerous ridges and furrows. The calycular portion is attacked first, turns black in colour; the fibrous husk rots and yields to the touch. No liquid, however, exudes from the affected parts as in the case of the '*Mahali*'. In the younger stages of the disease, on the husk, cobwebby, white hyphae characteristic of Perisporiales make their appearance. Later, the hyphal masses agglutinise, form a light hard crust, brown-black in colour. This crust is easily removed by the sharp edge of an ordinary scalpel In the months of July-August, perithecia appear on the crusts which can be recognised from a distance by their orange red colour. They are entirely superficial. The nut begins to fall down prematurely in large numbers.

The affected palms are also recognised by their leaves which are stunted, bunched together but without any resemblance to the prevalent yellow leaf disease.

Habitat. The palms are mostly grown on higher elevations at altitudes of 2000-3000'; the climate is cool in the nights, hot during the days with heavy precipitations during most part of the year. The palms are scattered along the ravines where erosion is high in the rainy weather. The fibrous root system is entirely exposed. Associated flora are rubber, tea and scattered shrubs of the mountain regions.

Losses. It has been estimated that the yield is reduced to half or even a third. The diseased nuts are shrivelled, the endosperm does not set, premature falling in large numbers occur.

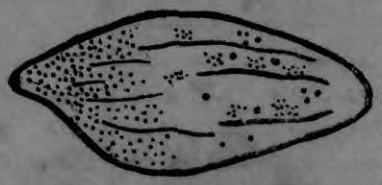

Fig. 1

Dimerosporina areca Menon

Mycelium superficial, in some cases extending below the cuticle, showing a tendency for agglutinisation as in the Capnodium; no setae or perithecial appendages are observed. Perithecia are superficial, soft, fleshy, sessile, glabrous; ostiole lacking, the ascospores escaping by cracks in the apical portion. Asci are umbellate, 8 spored, with no paraphyses. Ascospores are two celled, hyaline, granular in contents, ellepsoidal.

Hyphi hypophylli, hyalini; perithecia solitaria, erumpentia, aurantiacu, sine ostiola; 100-165x150-130Mue asci sub-cylindarcei vel ellipsoi - 16-27x3-4Mue, stipitati, antice late rotundati, 8 spori; sporea hyalinae, ellipsoidae, bicellulare, 4.5 - 6 x 1.5 - 3 Mue, sine paraphysis.

Habitat. In living areca catechu nuts-Ponmudi, Trivandrum, Kerala, India, collected on 28—7—1959 by R. Menon.

The disease forms epidemics when floods and too heavy monsoon rains are current. Dissemination of the spores is by wind and rains especially since the ascospores escape in the form of small puffs when mature perithecia crack.

Control. The palms are sprayed with 1% Bordeaux mixture before the rains twice a year; slight dusting of DDT also helps to give additional protection from the disease.

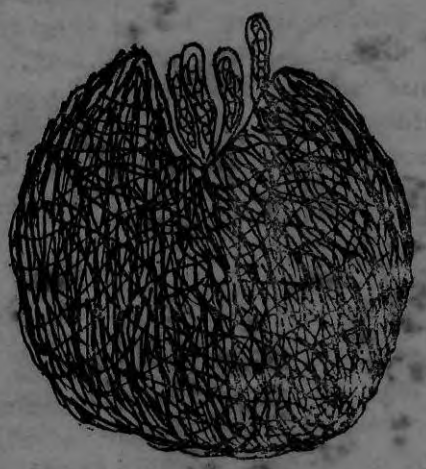

Fig. 2

Fig. 3

1. Fig. Habit. Dimerosporina on nut. Fig 1. Nat. Size.
2. Fig. Perithecium x 500.
3. Fig. Ascus and spores x 500.

2. Erwinia rot of arecanuts.

This has been a comparatively new disease on the arecanut palms occurring in isolated places. It has not been so far reported on the present host even though the disease causes very serious damage. The yield is often reduced to more than two thirds but no control measures have been resorted to as the disease has not been observed.

Symptoms. The affected palms do not show any damage to the foliage; the organism first appears on the flowers, sepals, pedicel and extends to the ovary. Associated with the bacterium, Phytophthora arecae has also been identified. Whether the bacterium attacks later or in the early stages prior to the Phytophthora invasion is not clear. However, unlike the nuts affected by '*Mahali*', here they are unfit for chewing purposes; on humans the nuts cause giddiness, perspiration and nausea. It is, therefore, plausible that the combined attack of the two pathogens cause the rotting and toxicity. On the nuts the bacteria exudes on the recently invaded parts amber and orange coloured droplets made up of bacteria in the gelatinous matrix of plant parts and bacterial bye-products. During spells of heavy rain followed by hot weather, the bacterial exudate forms aerial strands 30-35 Mu in diameter and 4-5 centimeters in length. These strands when examined under the microscope consist of bacteria and cementing substances. These are readily detached. The secretion dries up easily to a hard brown layer or forms beads in some cases.

Causal organism. The bacterium is rod shaped, with rounded ends. No flagellum has been noted. 1.5 x 1 Mue.

Locality. Palode, Vengeanthanam, Kerala. Collected by R. Menon, 15—11—59, 18—11—59, 24—11—59.

Disease cycle. The entry into the nuts is through the rotted tissues affected by '*Mahali*'. The pathogen lives in the rotted parts; the moisture for the harbouring of these pathogen is provided by the rotted tissues of the host. The further spread of the disease is facilitated by heavy rains; under conditions of dessication, the disease may be checked completely.

Losses. The nuts fall rapidly and husks rot. While this effect may be produced by Phytophthora arecae, on the kernels of the nuts certain peculiar characters specific to the bacterium is produced. On the nuts being dehusked, the outer brown layer is found to consist of longitudinal ridges without the formation of the anstamoses characteristic of the healthy nuts. The endosperm in a transverse section show very little of the white core; brown cracks and ridges extend in the interior also. In addition to these symptoms, the nuts are toxic in their effects of chewing.

Biochemical Studies. It has been proposed in view of the toxic metabolities released either by the host or the bacterium, to study the alkaloids by extraction of the nuts. Further, it is worthwhile to study the antegonism of the bacterium and the Phytophthora. Studies are in progress and shall be reported in due course.

Control It has been recommended to the ryots whose gardens show the ravages of the disease to spray 2% Bordeaux mixture before the flowering period; antibiotics are advocated to produce very good effects; but the economic conditions of the ryots did not permit the use of these. Cutting out the affected parts are found to be effective; the fertilisation of the soil is found to control the succulence of new nuts. Nitrogenous manures should be avoided and cover crops should be grown at base of the palms.

Stemonites sp.

Along with the bacterium and the Phytophthora a species of Stenonites also attacks the arecanuts. In the slime produced by the bacterium the Myxomycetes forms the plasmodium and the fruit bodies are formed later along with the conidia of 'Mahali' and rod shaped spores of Erwinia. Spores are violet blue, round, 2.5 – 3 Mue. further studies on this will be communicated later.

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3. **Bitter rot – Glomerella Cingulata (Ston.) Spauld and Schrenk.**

This organism also causes wide spread havoc in the nut. Epidemics have been caused due to the unusually humid and hot weather of the year. The ripened fruits fall off in large numbers causing decay. The pathogen has been identified as Gloeosporium; the spores are very much smaller than those of G. cingulatum Atk. The species has been described as G. arecae; perithecia have been recorded without mature spores.

Symptoms. The fruits are affected when they are green to slightly ripe; entire crops lost within a few days. On the calycular portion the pycnial pustules appear as round, black, glabrous pustules. On the surface of the nuts slight discolourations occur white patchy film covering the affected parts. Pycnia are abundant in the later stages of attack when the host tissues are decayed. The acervuli rupture in moist weather giving out masses of yellowish to dark cream coloured spores. On removing the spore masses the stroma appears as a blackened structure. Gummosis occurs in plenty on the surface of the nuts and on these bacterium attack occurs in some cases giving rise to very serious damage

Acervuli. Dark, parenchymatous, rupturing at maturity releasing the spor numerous conidiophores are formed, hyaline, unseptate cutting off the conidium at the tips. 15 – 30 x 15 – 30 Mue

Conidia. Hyaline, slightly coloured when they occur in large masses. Cylindrical, oval thin walled with a conspicuous nucleus in the middle of the spore. 1.5 – 3 x .75 – 1.5 Mue

Perithecia have been noted in the leaves examined from this locality; no sexual fruit bodies were observed on the nuts.

Locality. Palode, Trivandrum, Kerala. Collected by R. Menon. 23—11—1959.

Control. The dead and mummied fruits are to be burnt to prevent over-wintering of the spores. The fungus perrenates in the stroma producing the conidia whenever the conditions are favourable for their germination. It is found under experiments carried out in the laboratory that the conidia do not produce the perithecia. This may be explained by the occurrence of plus and minus strains described by Edgerton. Sprayings with Bordeaux mixture has produced good check of the disease. However, complete removal of the source of infection is very necessary for effective control of the disease.

References.

1. Edgerton, C.W., et al 1905. Geneties of Glomerella 11. Fertilisation between strains. Amer.Jour.Bot., 32: 115–118.

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