DISEASE PROBLEMS IN ARECANUT

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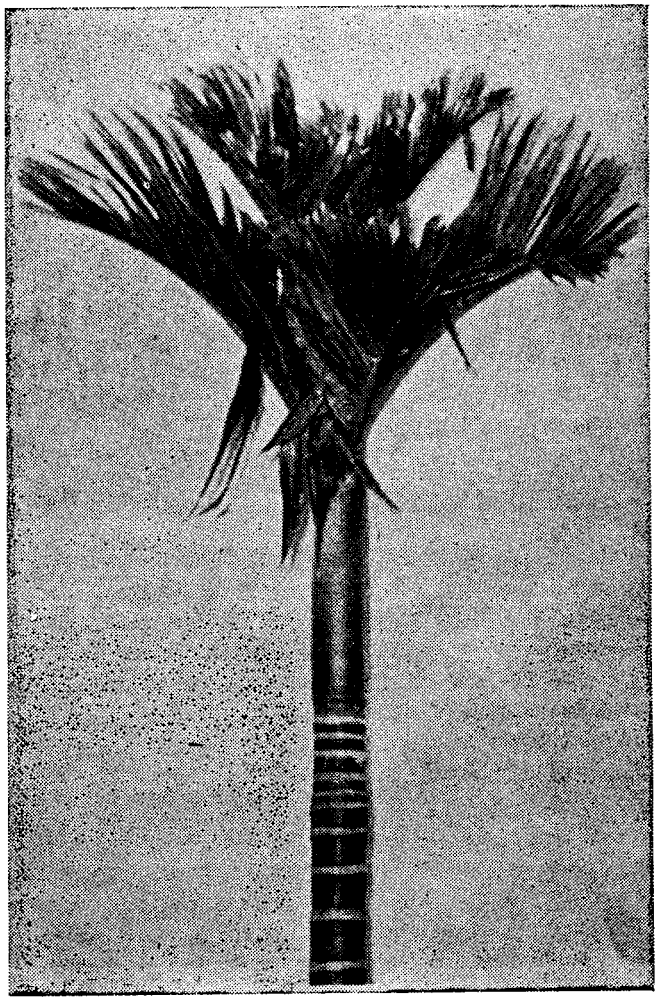
A Band disease-affected palm



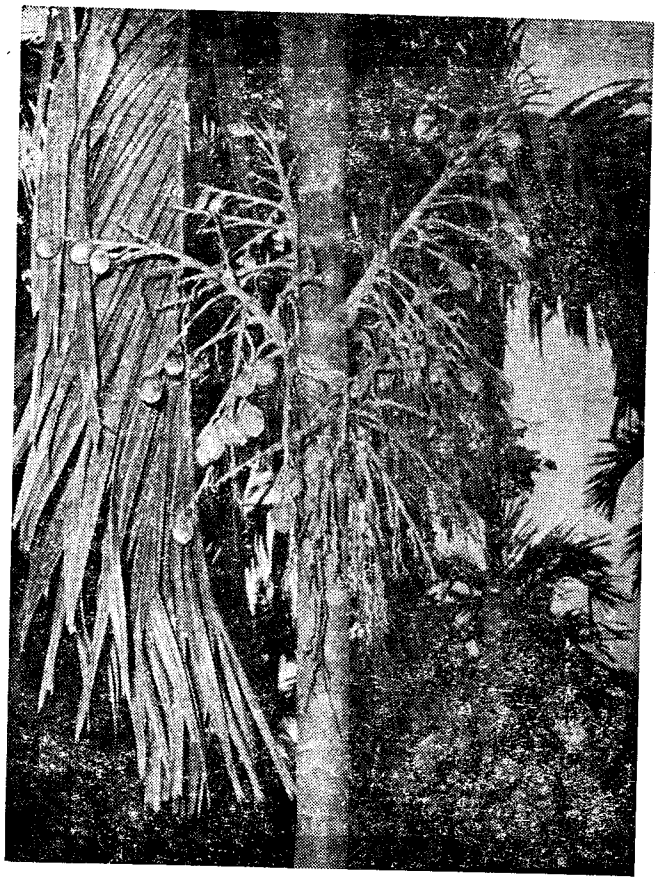
The symptoms of Band disease are the production of small crinkled dark green leaves; tapering of stem and reduction in yield

ARECANUT is prone to several diseases of microbial origin. Some of the diseases are very severe and widespread while a few others occur occasionally. A brief outline of the major and minor diseases of arecanut is given below.

Mahali

Mahali or Koleroga or fruitrot is widespread in all the areca growing tracts causing severe economic losses; in some instances as high as 80 per cent. The symptoms of the disease are the appearance of dark green water-soaked lesions on the nut surface near the calyx. In advanced stages these lesions coalesce and form a general greenish black appearance on the nuts. The causal organism is *Phytophthora arecae* and this pathogen seems to infect the palms with severity particularly in areas with high humidity as a result of alternate sunshine and rains. Closely planted gardens with high plant density seem to favour the appearance and fast spread of the disease. The fungus mainly spreads through rain splash and is also known to be transmitted through birds, insects and wind.

The best preventive measure for the disease still remains to be spraying of 1 per cent Bordeaux mixture and a minimum of two sprayings are required, first spraying immediately after the first monsoon showers and second 40—45 days thereafter. In years with an



Mahali or fruit rot-affected palm. The disease is widespread and causes severe economic losses.

extended monsoon an additional spraying should be undertaken. As a preventive measure periodic collection of infected plant parts and its destruction by burning is also advocated to reduce the inoculum of the fungus.

Bud rot

This disease is also caused by the same organism causing mahali. But in this case primarily the younger leaves or the spindle gets infected. The fungus is known to gain access to the bud through the space between the spindle and the petioles of the uppermost leaves. Initially the affected spindle appears yellow changing to brown and finally the whole spindle rots which can be easily removed from the crown in the very advance stages. The outer whorl of leaves also become infected exhibiting symptoms of yellowing, drooping and dropping. The disease seems to be severe during summer months but initial symptoms become apparent during the preceding winter months itself. The fungus is known to remain infective for a long time in the bud or other infected plant parts and get spread due to wind.

Early detection of the disease and prompt removal of the infected leaves will help in preventing the spread of the disease. The affected portion of the bud can be removed by making a longitudinal slit on one side of the stem and the remaining healthy tissues should be treated with 1 per cent Bordeaux paste. As a preventive measure spraying of 1 per cent Bordeaux mixture to the foliage including the spindle is recommended. Destruction of mahali-affected bunches in a garden will minimise the incidence of the disease.

Anabe roga or Fruit rot

This disease is considered to be the major problem in the Malnad and Maidan areas of Karnataka where the loss in affected garden may exceed 15 per cent. The pathogen involved is a fungus *Ganoderma lucidum* and is similar to the mushroom fungi. The disease is of wide occurrence in soils with poor drainage or a high water table and spreads through soil by root contact. If fruiting bodies are formed the spores will also get disseminated aerially through wind.

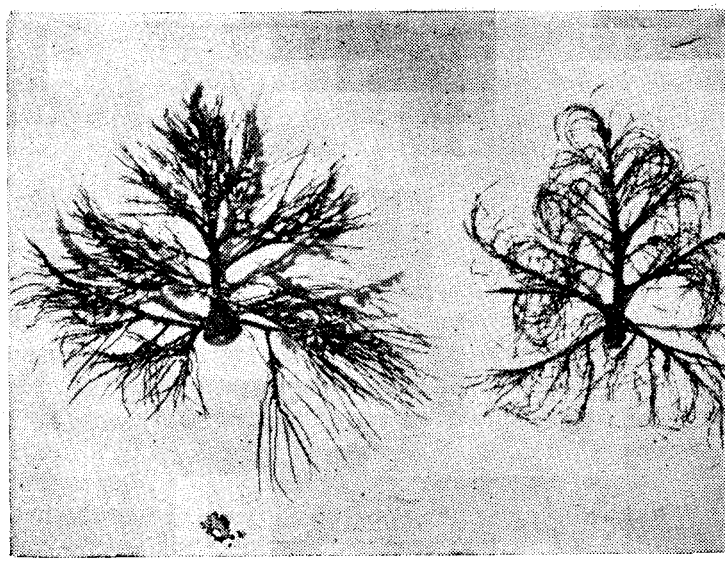
On the left is a healthy crown; on the right a dead palm—victim of bud rot

It is difficult to identify the disease during the early stages of infection and has proved to be a handicap for taking proper curative measures. However, the infected trees have a tendency to exhibit symptoms of

A root-wilt affected palm—advanced stage

drought with yellowing of outer whorl of leaves which at later stages droop down. With the progress of disease small brown irregular patches appear on the stem about one metre from the ground level. A brownish ooze from these patches can also be detected. Exposure of roots of infected palms shows varying degrees of discoloration and rotting and will be brittle. Similar discolouration of the stem near the base could be detected. The infected palm eventually succumbs to disease and the characteristic fruiting body of the fungus emerge out from the base of the stem.

Proper management of the garden seems to be the the only way to check the disease, particularly better drainage and clean cultivation seems to be very important. In recently cleared and planted gardens it is advisable to remove dead stumps and also avoid dense planting. As the fungus is known to infect other trees such as *Delonix regia, Pongamia glabra* and *Cassia* sp. Planting of such trees in the vicinity of arecanut gardens should be avoided. Once a diseased palm is recognized the plant should be isolated by digging deep trenches one metre away from the base of the palm. Similarly if replanting is taken after removal of a diseased palm



On the left is healthy inflorescence; on the right infected inflorescence which is unhealthy because of die-back disease

treatment with soil fungicides such as ceresan, captan, etc., is advisable.

Inflorescence die-back and Button Shedding

This disease is reported to be prevalent in Kerala and Karnataka particularly during summer months from February to May. The prominent symptoms are yellowing and drying of rachis which is followed by shedding of female flowers. The disease may be due to several factors such as pollination failure, nutrient, water and temperature stress or some other physiological disorders. A pathogenic fungus *Colletotrichum gloeosporioides* is known to be associated with the shedding of flowers.

If the cause of die-back and button shedding is recognized to be due to the fungus it can be controlled with two sprayings of Dithane Z-78 at 4 g/l water, the first spraying at the time of opening of the female flowers and the second 20-25 days thereafter. Removal and burning of infected plant parts helps in reducing the disease incidence.

Yellow Leaf Disease

This disease is prevalent in southern Kerala, coastal Maharashtra, interior Karnataka and some parts of Tamil Nadu. Wherever the disease has been noticed, the incidence has been found severe although in isolated pockets. The primary symptoms are the yellowing of the leaves which appears on the leaf margins and progresses inwards. In advanced stages necrosis of leaf lamina becomes apparent. The other symptoms are a reduction in crown size, tapering of the stem and a gradual reduction of the nut yield. The kernel from the affected nuts will be dark brown and unsuitable for chewing. Blackening and brittling of the feeder

root tips is also constantly associated with the disease. The cause of the disease is yet to be established but more recently mycoplasma has been implemented.

Proper care of the palm is the only suggested method to prevent the losses due to the disease. Application of fertilizers such as N, P and K, liming of the soil and providing proper drainage will help in reducing the losses due to the disease by improving the health of the palm.

Band or Hidimundige (Kannada) is a Marathi name for a fairly serious disease of arecanut noticed in Ratnagiri and Kolaba districts of Maharashtra. The prominent symptoms of the disease are production of small crinkled dark green leaves, tapering of stem and reduction in internodal length. In advanced stages the crown may present a rosette appearance. Inflorescence if at all produced is small and malformed. A drastic reduction in yield is usually associated with the disease. The cause of the disease is still not known. However, no fungal, bacterial or virus agent is associated with the disease.

There is evidence that by improving drainage in ill-drained gardens where the disease is usually reported to occur, the incidence can be reduced. Loosening of the hard soil stratum to improve the aeration also is known to reduce the disease incidence. Application of equal quantities of copper sulphate and lime at the rate of 112 g each per palm twice a year has been found to improve the health of the affected palm.

Sun-scorch and Stem-breaking

This disease is more an effect of adverse weather conditions rather than pathological. Usually palms exposed directly to the south-western sun are badly affected. The exposed stem portion initially becomes golden yellow and later turns to brown and looses turgidity. In advanced stages fissures in the stem are also apparent. The situation is worsened by secondary pathogens and insects resulting in decay of stem which ultimately breaks during heavy wind. This problem can be easily overcome by tying areca sheaths or thick opaque alkathene sheets on the exposed stem. Palms exhibiting advanced symptoms of fissures are reinforced with split areca stem. Planting of quick and tall growing shade trees on the south-western side of the garden and adoption of proper technique of alignment while planting will greatly minimise the damage due to sun scorch.

Minor Diseases

Stem bleeding. The problem even though minor is found to be severe in some isolated areas in Kerala and Karnataka. Usually palms in the age group of 10-15 years are known to be more susceptible to the disease. The initial symptoms are discoloured depressions on the stem which later splits leading to the disintegration of the fibrous nature of the stem tissue. In advanced stages a brown ooze is also noticed from the fissure. The cause of the disease is known to be a fungus *Thielaviopsis paradoxa.* The disease is common in areas with a higher water table and therefore responds to the agronomic practices and improved drainage. Application of hot coal tar or Bordeaux paste after scooping the affected tissues helps in checking the disease.

Shoot rot. This disease is of rare occurrence and occurs only in monsoon particularly in low lying and overcrowded gardens with high humidity. The causal agent is known to be a fungus *Gloeosporium.* The prominent symptoms are yellowing of the inner whorl of leaves, upward curling of leaflets and a reddish brown patchy discolouration of the spindle and the inner whorl of leaves. In later stages necrosis and rotting can be noticed. In severe cases palms are known to succumb within two weeks following the infection. If detected early the disease can be controlled by spraying with 1 per cent Bordeaux mixture.

Bacterial Diseases

Bacterial leaf stripe. The disease is confined to the *maidan* areas where arecanut is cultivated and particularly known to be endemic around Tumkur in Karnataka. It is caused by a bacterium *Xanthomonas arecae.* The prominent symptoms are dark green water-soaked lesions on the leaf lamina, translucent linear lesions or stripes along the sides of the parallel to the midrib of the leaf. On the corresponding lower surface the lesions show a creamy white exudate. When wet the exudate is slimy but on drying it becomes waxy and leads to necrotic patches on the leaves. In severely affected foliage the lesions may be one centimeter or more wide and several centimetres long, oftentimes affecting the whole leaf. The infection causes partial or complete blighting of the leaf and in extreme cases the plants are known to succumb to the infection.

The disease can be controlled by the application of antibiotics such as streptocycline or tetracycline at 500 ppm concentration. The schedule of spraying recommended is fortnightly sprays from July to October.

Physiogenic Disorder

Nut splitting. The disease is not due to the association of any pathogenic micro-organisms or insect pests but usually restricted to gardens in very low lying areas adjacent to paddy fields having a very high water table. The disorder is reported to occur in almost all the areca growing tracts. The plants are known to absorb more water resulting in swelling of the kernel leading to development of split on the husk. The problem can be overcome by making longitudinal slits along the axis on the spadix when the nuts are half mature in a bunch. Additionally proper drainage is known to lessen the incidence. Spraying of borax at 2 g/l water is also found effective. There is a need to carry out further

research on this problem because of its wide occurrence and insufficient information on the cause and cure of the disorder.

Nursery Diseases

There are several diseases and disorders found to affect the arecanut nurseries as the nurseries are retained usually for over a period of 1-½ years, some of these become serious.A few important nursery diseases are discussed here.

Collar rot. This is considered as a major problem on the nurseries and newly planted seedlings during monsoon. Waterlogging due to poor drainage is known to be an important predisposing factor. The initial infection is caused by bacteria and the fungal organisms namely *Fusarium* sp. and *Rhizoctonia* sp. become more prominent subsequently. The infection is usually initiated on the point of contact on the soil, leading to rotting. Infected seedlings appear healthy with the outer whorl of leaves green. But the spindle becomes discoloured due to rotting. Raising nurseries in well-drained areas and soil-drenching with 0.1 per cent ceresan wet or 1 per cent Bordeaux mixture are known to control the disease.

Yellow leaf spot. The disease occurs usually during summer months from February to April. The symptoms are small, yellowish discolouration on the leaf lamina which coalesce to form large spots. The infection reduces seedling growth or vigour or even causes death of the seedlings in severe cases. The causal organism is a fungus identified as *Curvularia* sp. Some other fungi such as *Colletotrichum* sp., *Phyllosticta* sp. and *Helminthosporium* sp. also cause leaf spots. Since the disease is prevalent in serious proportions in ill-drained and exposed nurseries, practices to improve drainage and providing shade to the seedlings reduce the disease considerably. Spraying with1 per cent Bordeaux mixture or dithane or ziram are effective in controlling the disease.

Leaf blight. There are different types of leaf blights affecting the areca seedlings in the nurseries. The symptoms and organism involved in each kind of blight is given below.

The disease is not of common occurrence but is occasionally reported from parts of southern Kerala during the months of February to June. The symptoms are reddish brown discolouration on the leaf lamina which later wither away leading to necrosis. In severe cases blighting of the entire leaf was also recorded. The disease is caused by a fungus *Pestalotia palmarum.* Poor fertility status of the soil is the major predisposing factor for the development of the disease. Application of muriate of potash and ammonium sulphate to the soil and spraying the foliage with 1 per cent Dithane is known to check the disease.

A second type of leaf blight is caused by *Phomopsis palmicola* affecting the seedlings or young plants after transplanting. The prominent symptoms are the formation of brown round spots with darker brown zones on the lamina. These spots may coalesce to form irregular large patches leading to withering. Severe infection may cause stunted growth of seedlings.

A third type of leaf blight is caused by an uncommon algal parasite *Cepheleuros.* The algal parasite is however known to be a serious problem on coffee. The distinguishing symptoms are circular spots with sunken centres and raised margins having yellow halo on the leaf lamina. On the stem, rachis and leaf sheath these spots appear without the yellow halo and sunken centre. Infection leads to destruction and discolouration of the epidermis. The common control measure is spraying with 1 per cent Bordeaux mixture besides providing adequate shade.

Another type of blight usually called as seedling blight is caused by *Nigrospora spherica.* The symptoms appear as yellow spots with greyish fringe, usually on the midrib. In advanced stages of infection a light grey gummy exudate oozes out on the under surface all along the midrib forming dark encrustations. At times lamina is also affected giving the plant a burnt appearance. The seedlings as well as 4-5 year old young palms exposed to direct sunlight are more susceptible. Providing shade and timely spraying with any copper fungicide is effective in checking the disease.

Wilt. This is another common disease affecting the arecanut nursery. Isolated patches of wilting occur in the nursery and at least two fungi namely *Rhizoctonia* sp. and *Fusarium* sp. are found to be associated with the wilting. The fungi gain entry through the roots and block the vascular tissues resulting in wilting. Soil drenching with 1 per cent ceresan before raising the nursery effectively minimises the disease.

Of the diseases discussed, mahali, bud rot, anabe roga and inflorescence die-back caused by one or the other fungus are comparatively more serious and destructive causing considerable economic losses. Therefore presently research work being carried out at various locations in CPCRI and elsewhere is concentrated in tackling these diseases. Copper fungicides are found universally suitable in preventing the diseases and Bordeaux mixture is most commonly used to check the spread of the diseases. But considering the fact that mostly areca is cultivated in areas characterised by very heavy rainfall, it is necessary that an alternative to contact fungicides be found. A systemic fungicide with effectivity and a broad range of activity against several fungi may prove to be the ultimate solution for this problem. Studies are underway to evaluate the efficacy of some systemic fungicide having specific action against the fungi and the same time low residual activity. Such fungicide may be more acceptable from the point of view of the environment. Recent studies

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30 cm width and of required length are recommended in alternate rows of areca palms. It is preferable to open the channels prior to the planting of seedlings. The depth and width may also vary depending upon the local situations, depth of water table, soil conditions, depth of root zone, etc. A main channel will have to be provided as an outlet for the accumulated water to drain out of garden. Under certain conditions of topography and soil there are possibilities of collecting water in the planting pits. If the soil is impermeable or if it is of hard laterite in nature, drainage of water from such pits becomes very difficult. To overcome such situations each pit will have to be connected to the adjacent drainage channels by providing sub-channels for facilitating the easy flow of water into the drainage channel.

In certain localities due to poor structural nature of the soil deepening of channel becomes impracticable and in such places earthen pipes may be used as an underground drainage system. Earthen pipes of about 15 cm radius and 60 cm length with perforation giving a slope of $\frac{2}{1000}$ to $\frac{8}{1000}$ mm may be buried in the required depth. A gap of 2 to 3 mm may be provided in the joining regions of two pipes in order to facilitate the accumulated water to flow out. In some areca growing locations there may not be any possibility to provide drainage due to lack of soil depth. Gradual raising of gardens by the application of fresh earth from external source is the only way out in such situations.

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DISEASE PROBLEMS

have shown that Redonil and Alliott are promising.

It is well known that anabe, if diagnosed early, can be tackled effectively. But so far this has been a major handicap in controlling the disease. Recent research is to concentrate on the development of a sensitive serodiagnostic or biochemical method to identify the potentially inefective soil or palm in initial stages of infection. Field trials are presently in progress in a heavily infected garden at Hirehalli, Karnataka have indicated encouraging results with captan (0.2 per cent) as soil-drench.

Yellow leaf disease has so far eluded a solution because of its complex nature and lack of knowledge on etiology. However, proper management of the diseased palm seems to be the only solution for the present for this, as well as other diseases of unknown etiology to minimise the losses.

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VARIETAL IMPROVEMENT

front. It is, however, considered to be a valuable breeding material with a scope for improving its yield by hybridisations. How this type and its hybrids in several combinations of crosses would react to disease situations with special reference to Yellow-leaf disease may have to be watched with interest. This is because, this diease is posing a threat to areca cultivation in the southern tracts of Kerala and the landlocked districts of Karnataka and eludes the possible chemical control measures. This situation as such now poses a challenge to the breeder and the possible solution is the evolving of types resistant to it.