

'ANABE ROGA' OF ARECANUT (ARECA CATECHU L.)

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'Anabe roga' also known as 'wilt' or 'foot rot' is a major disease of arecanut accounting for enormous loss of palms annually. Though next in economic importance to 'Koleroga' or fruit rot, it is considered more dreadful on account of its ability to kill the palms outright. Besides, while the former can be checked by proper control methods, the latter still lacks a solution and even preventive measures are not fool-proof. Once the fungus gains a foot hold inside the palm, there is little that can be done to save the palm.

Distribution and damage

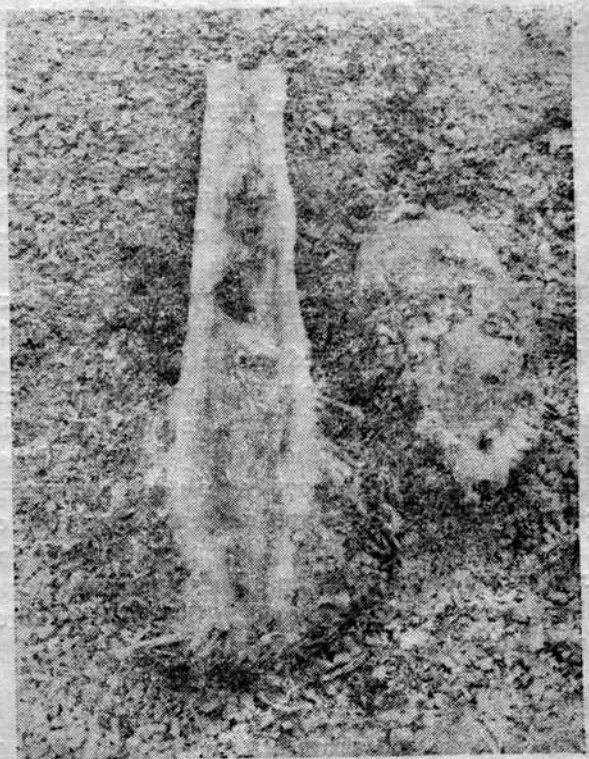
'Anabe', reported first about eighty years ago as 'betelnut plague' is chiefly prevalent in maidan and semi-malnad areas of Karnataka, in Mettupalayam tract of Tamilnadu, in parts of Kerala, Assam, West Bengal and the Andaman & Nicobar Islands. It is particularly severe in neglected, ill drained and over crowded gardens; in hand, black loamy and acid soils and in soils of higher iron and lower calcium contents. Generally productive palms of age group 20-40 years are infected, though occasional instances of attack on younger and older palms are also reported. In the infected gardens there has been a steady though not heavy loss of palms and the annual mortality has been estimated as low as 0.5 to 5% in Tamil Nadu to as high as 12 to 15% in Karnataka.

Symptoms

The first visible symptom to appear is the discolouration of the outer whorl of leaves which gradually spreads to other whorls giving the entire crown a dull yellow colour as if hit by drought, and is followed by drooping the outer whorl of leaves. The crown soon dries up and leaves fall off one after the other leaving a bare trunk. Nuts and inflorescence if any also shrivel, dry up and fall down. As the foliar symptoms advance, the base of the stem shows a brown discolouration and oozing of a dark fluid up to about 1 to 1.5 metres above the ground level. Whitish globular sporophores emerge at the base of the trunk which

later develop into characteristic reddish brown brackets called the 'Anabe'.

Anatomy of the infected stem reveals infection only up to 1 to 1.5 metres above the ground level, beyond which the stem is quite normal. The interior of the infected stem, bole and the roots exhibit brown discolouration and emits a musty smell. The vessels and xylem parenchyma get disintegrated or clogged by tyloses on account of the invasion of the fungus, thereby cutting off the transport of water and nutrients to the crown causing 'wilt' and eventual death. The infected roots are brittle, discoloured and dry and have been found to contain less of total phenols and exhibit less polyphenoloxidase activity than the healthy ones.



L. S. of the bole affected by 'anabe'

Casual agent

'Anabe roga', a local name in Karnataka, literally means a mushroom disease, the mushroom being the fungus *Ganoderma Lucidum* (Leys) Karst. This heterothallic, tetrapolar basidiomycetous fungus grows well on a number of synthetic and non-synthetic media in the pH range of 4.5 to 6.5 and secretes a number of hydrolytic enzymes into the culture medium. It produces 3 types of spores—basidiospores, secondary spores and gastospores and in addition chlamydospores for dissemination.

Ganoderma sp. is a slow growing wood rotting parasite capable of disintegrating both lignin and cellulose. It has a wide host range comprising of more than 40 species belonging to about 36 genera of 19 families, in all and has been recorded on mango, *casuarina*, *cassia*, tamarind, coconut, *Pongamia* and *Delonix*. Besides, it is infective on the common weeds *Phyllanthus* sp. and *Acanthospermum* sp. The fungus has been found to have antigenic properties and the antiserum developed has been shown to have sero-diagnostic potential for early detection of the disease.

Mode of infection and spread

G. lucidum is a rot infecting fungus and spread from one palm to other through soil particularly by root contact. It also spreads by air-borne spores. When healthy roots of the neighbouring palms come in contact with the infected roots, they pick up infection. The zone of infection is upto 30 centimetres below ground surface. Under favourable circumstances the fungus can grow well and can simultaneously infect many roots. However, the target of the fungus seems to be bole and trunk, the roots serving merely as entry points and that explains why all roots are not infected. Till the infection reaches the base of the trunk the palm remains fed by the uninfected healthy roots and therefore does not show any adverse symptoms or indicate infection. Once the infection reaches the stem, the fungus spreads rapidly laterally, breaking down and blocking wood vessels and surrounding tissues. Supply of water and nutrients being thus cut off to the top, an artificial drought condition is induced and the crown dries up. The fungus is reported to have a set pattern of spread in line with the direction of formation of fruiting body.

Prevention

True to time old proverb, 'Anabe' can better be prevented than cured and what cannot be cured has to be endured. Plantings in newly cleared jungles containing dead stumps should be avoided. Care should be taken for better drainage and clean cultivation of

gardens and overcrowding with too many palms and with intercrops should also be avoided. Planting of susceptible trees such as *Delonix Regia*, *Pongamia Glabra*, *Cassia Siames* etc. in close proximity to areca gardens should be discouraged. Fruiting bodies of the fungus and dead stumps of diseased palms should be removed and burnt without delay. Diseased palms must be isolated by digging trenches (.5m × .3m) at a distance of 1 to 1.5 metres from the base of the trunk. Planting *Euphorbia* sp. around the base of the infected and surrounding palms has been observed to have inhibitory effect on the spread of the disease.

A large number of preventive and curative chemicals have been tried against the disease with varied results. Sulphur application was reported to be effective by earlier workers; but has been found to have no effect by later investigators. Mercuric chloride, copper oxychloride, cycloheximide, difolatan, vitavax and aureofungin sol have been reported to be effective; but need further evaluation. In the field fungicidal trials now in progress at Central Plantation Crops Research Institute, Hirehalli in Tumkur district of Karnataka, captan (0.2%) as soil drench has given encouraging results; but this again needs further observation for a couple of years more for confirmation.

Present and future line of work

Early detection of the disease at the incipient stage is very important, in view of a long incubation period of the fungal pathogen. More often by the time visible symptoms develop on the host plant, it becomes too late to take effective control or preventive measures. The present research efforts are therefore focussed on developing suitable biochemical and serological tests for an early detection of the disease.

Most of the soil-borne fungal diseases do not respond to chemical control easily and therefore biological control would be the possible solution in the long run. Studies on microbial interactions in soil revealed that *Trichoderma* sp. *Bacillus coagulans*, *Streptomyces* sp. and *Mucor* sp. are antagonistic to *G. lucidum*. Detailed investigations on soil microflora associated with healthy and diseased palms will provide additional information on potential antagonists. Future thrust, therefore, should be on enhancing their activity in the root zone and exploring the possibility of biological control of the disease. It is also necessary to study the host range of the pathogen which would enable a more pragmatic approach to develop suitable mixed or multiple cropping systems to be adopted in areca cultivation.