SUNSCORCH IN ARECA

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The areca palm (*Areca catechu*) is cultivated in about 3,00,000 acres in India chiefly in the States of Madras, Mysore, Travancore-Cochin, Bombay, West Bengal and Assam. The bulk of the area is however in S. India. The palm is grown at different altitudes ranging from sea-level to about 2,500 feet. The cultivation methods vary in different tracts. In parts of S. Kanara and in Coimbatore Districts and in certain parts of Mysore State pure areca gardens are generally located in sheltered valleys where facilities for irrigation exist and where the palms are irrigated during the hot summer months. In some parts of Malabar District and in the State of Travancore-Cochin, areca is planted mixed with coconut, rubber, pepper, etc. Sometimes the palm is grown indiscriminately in exposed situations on the slopes of hills without provision for shade and without facilities for irrigation during the dry months.

The growth of the palm and the yield of nuts vary considerably in proportion to the attention bestowed and the maintenance of adequate soil moisture during the dry months. The best returns are obtained from well manured and irrigated gardens, while those growing on hill slopes where the soil is parched up for over four months of the year and where torrential rains wash down the soil during the monsoons, are usually poor in growth with thin stem and yellowish foliage producing small bunches and giving poor yields.

This palm is subject to several diseases, the chief among which are the fruit rot and bud rot (*Phytophthora palmivora*), wilt (*Ganoderma lucidum*) and 'band' (a physiologic disorder). In recent years another type of damage resulting in the formation of splits, cracks or depressions in the stem or cavities inside the stem, is reported to be becoming conspicuous. Such palms are easily broken during the gales associated with the monsoons. This kind of damage has been noticed by most of the growers from days of old and many of them had realised that it might be due to sunscorch. But some growers in S. Kanara were under the presumption that this type of damage was the result of the continuous use of Bordeaux mixture for the control of fruit rot. However this presumption could not be maintained as the same type of damage occurs in localities where this fungicide had never been used, as in Mettupalayam or Wynaad. The location of the affected portion always

between the western and southern sides of the stem proves that this assumption is not correct. Only palms which are exposed to the sun exhibit the damage.

Venkatarayan (1931) has reported the frequent occurrence of such damage in the Malnad areas of Mysore. Sundararaman and his co-workers (1928) have described a stem-bleeding disease of areca caused by *Ceratostomella paradoxa* in Malabar and Coimbatore. Later observations have shown that for all practical purposes this disease is noticed only on palms previously affected by sunscorch.

The damage caused by sunscorch is common in many gardens in Madras and Travancore-Cochin States. Both young and old palms are affected. Those growing in situations exposed to the sun during the afternoon are the ones involved. The damage is all on one and the same side, the south-western side of the stem. The drying and destruction of the tissues in the outer portions of the stem are noticeable for varying heights. In some, cavities are developed at the base and these extend upwards to a height of three or more feet from the ground. In others such cavities are noticed a few feet below the crown and continue to very near the base. In still others these occur in the middle portion. The extent of the damage appears to be due to the length of exposure of the tender portions to the sun and the ravages of secondary organisms. In young palms the exposed surface turns yellow and dries up. Fissures are formed in these portions and sooner or later cavities appear extending from the base upwards. These cavities are usually broader below and tapering above. The tissues are dark and the vascular bundles stick out as dark fibres. A dark fluid may sometimes be seen flowing out of these depressions. Usually this becomes evident when secondary infection by *C. paradoxa* has occurred. In the older palms also such depressions may develop. These may be of varying depths being shallow in some and deeper in others. In some instances only a split is visible externally but the disintegration of the tissues would have proceeded inside the stem leading to the formation of cavities whose extent could not be easily gauged from outside. In the older palms the stem is rendered weak by the disintegration of the tissues and many of them break when strong winds blow. Sometimes the disintegrated portions drop off early exposing a dark flat fibrous surface. In such cases the damage is relatively superficial and further progress of deterioration is slow. Such palms may not easily break during gales.

The dark colour of the cracks and fissures is due to the invasion of the tissues by various weakly parasitic fungi. *C. paradoxa* was the most common

isolate obtained from the affected tissues. This fungus produces large numbers of dark coloured spores which contribute to the colour of the invaded tissues. Sporophores of *Ganoderma lucidum*, *Lenzites* sp., and *Polystictus* sp. have also been found growing on the affected portions of the stem. Narasimhan (1934) has recorded the occurrence of *Dædalea* sp. on such palms in Mysore.

In order to find out if any of these fungi were responsible for the damage, they were first isolated from the damaged tissues and brought into pure culture. These were utilised for inoculating the stem of middle-aged palms (20 years old). In one series, the inoculations were made by placing bits of culture on the unwounded stem. Over these sterilised wet cotton-wool was laid and then alkathene sheets were tied round the stem enclosing the inocula. In a second series the stem was wounded prior to inoculation. Suitable controls were maintained. When the palms were examined after 10 weeks no change was noticed in the first series of inoculations and the controls except for the development of innumerable lenticel-like eruptions on the stem under the alkathene. But in the second series, cavities, about an inch in depth had formed and the tissues had disintegrated to a distance of about two inches above and below the point of inoculation. The growth of the particular fungus was observed in the affected tissues. The vascular bundles were found to be sticking out as darkened fibres. The extent of damage was more in those inoculated with *C. paradoxa*, *Lenzites* sp. and *Ganoderma lucidum* and less in the ones with *Polystictus* sp. The results led one to infer that the fungi found on the affected palms in nature do not infect through healthy surface but only through previously damaged or wounded portions. In nature the sunscorch-affected portions should function as places of entry for these organisms. Once having entered the stem these organisms which are always present in the arecanut growing tracts of the south, cause disintegration of the tissues leading to the development of cavities and depressions.

The location of the affected portion always between the western and southern side of the stem indicated that the prime factor responsible for the damage should be the lack of protection from the heat of the afternoon sun. The damage is invariably confined to the palms on the outskirts, whose stem is exposed to the afternoon sun. In thinly planted gardens, palms in the interior also exhibit such damage as adequate shade is lacking and exposure to the sun is more widespread. The temperature on the surface of the stem on the four sides of palms in the shaded and exposed portions of the garden were recorded daily during the hot weather. It is reported that in the afternoon the western and southern surfaces of the stem of palms in the

exposed and unprotected parts registered about 8° to 18° F. over the temperature on the northern and eastern surfaces of the same palms. Such differences were not observed in the forenoon or in the shaded areas (*Progress Report of the Scheme for the Investigation of Stem-Breaking Disease of Areca*, 1953–54). This rise of temperature is bound to have an adverse effect on the surface layers of cells of the tender portions resulting in their drying. Splits and cracks result when further growth takes place and the dried portions do not grow to keep pace with the rest of the stem. Various fungi enter through these cracks and infect the internal tissues. Thus protection of the stem, especially the tender portions from the hot afternoon sun, is called for as the initial measure to prevent this type of damage.

Methods of Protection.—Normally the site recommended by experienced growers for the location of areca gardens is in a valley with hillocks on the south and west, which will cut off the afternoon sun. Slopes of hills facing west or south are to be avoided. It may not always be possible to select such situations. As an alternative step it will be necessary to provide shade on the west and south by raising several rows of shade trees in advance of planting areca. The trees selected should be quick-growing, capable of attaining the same height as areca and should be evergreen. Tall-growing plants like coconut, jack, *Aini* (*Artocarpus hirsuta*), casuarina and other similar ones selected according to the suitability to the locality should be planted in several staggered rows. This is to be carried out while planning an areca garden. But in existing gardens which are in need of protection other palliative measures have to be thought of. It is customary in some gardens to tie leaf-sheaths of areca or banana round the tender portions of the stem to keep off the sun. This is a good practice which can be followed with advantage. Another method of protection against sunscorch adopted in orange gardens and rubber estates is to whitewash the exposed portions of the main stem with lime. This method has been reported to have been tried on areca using zinc-white and lime. Though these trials have been of short duration only zinc-white is stated to be promising (*Progress Report of the Scheme*, 1953–54).

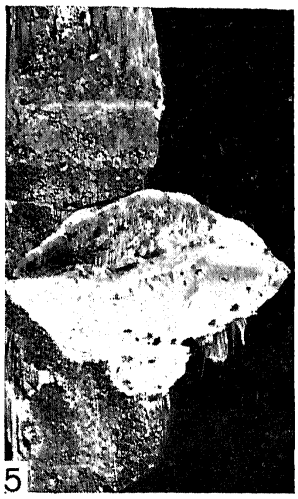
Raising mixed gardens of coconut and areca may prove beneficial in preventing sunscorch provided the areca palms are not on the outskirts. As a matter of fact splitting of the stem and stem-breaking are less common in such mixed gardens. In addition to the raising of shade trees on the outskirts it is necessary to maintain the interior of the garden in a cool and humid condition. Bananas are often grown intermixed with areca for this purpose. But the former is a heavy feeder and may be a keen competitor for areca in the removal of nutrients from the soil. Attention to proper

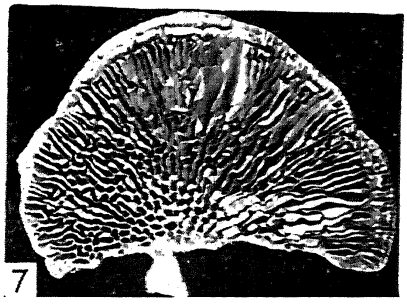
manuring with green leaves, potash, rock phosphate and well-preserved cattle manure will help to invigorate the palms and prevent their rapid deterioration. These should be worked into the soil or placed in a trench one-and-a-half to two feet away from the base and covered over and not dumped on the ground at the base as is being done in some gardens. The cultivation of cover crops like *Calopogonium mucunoides*, *Pueraria phaseoloides* or *Mimosa invisa* will be of great advantage as these will keep down the soil temperature and help to conserve soil moisture besides preventing soil erosion on hill slopes. The two latter plants have been tried with success in coconut gardens. To provide adequate supplies of green leaves, *Gliricidia maculata* may be grown along the borders and other vacant spaces. The loppings from these could be used for the supply of green leaves.

The palms which are in the initial stages of sunscorch damage, should be protected from further deterioration by removing all the affected tissues completely. The exposed surface should be protected by painting some fungicide like Bordeaux paste or Brunolinium. After the fungicide has dried a coating with some water-proofing substance like Stanvac Special Petrolatum should be applied to prevent water soaking in during the monsoon. These operations should be thorough to be useful. Partial or incomplete removal of the dead tissues will not prevent further damage. As a precautionary measure against the breaking of the stem, the damaged areca palms may be tied to neighbouring coconut palms or other tall and strong trees or among themselves by means of sufficiently long thick galvanised iron wire and thus prevent them from swaying too much in the wind. This will be similar to what is being adopted in parts of Travancore-Cochin State to prevent leaning coconut palms in the neighbourhood of buildings from falling over.

SUMMARY

The incidence of stem splitting and breaking is widespread in areca. This is not caused by the use of Bordeaux mixture for the control of fruit rot as was presumed by some growers. Exposure to the hot afternoon sun and the consequent scorching of the tender portions is the prime cause. Further damage is caused by the invasion of the affected tissues by more than one species of wound parasitic fungi. Provision of adequate shade is the best method of preventing this. The damaged portion is invariably between the western and southern sides of the stem. Any neglect in providing for shade at the planting time cannot be rectified easily later.





FIGS. 1–9

LITERATURE CITED

1. Narasimhan, M. J. .. *Mysore Agric. Cal.*, 1934, 21–25.
2. Sundararaman, S., Krishnan Nair, C. K. and Ramakrishnan, T. S. *Bull. Indian Agric. Res. Inst. Pusa*, 1928, No. 189.
3. Venkatarayan, S. V. .. *Mysore Agric. J.*, 1931, 49–50.
4. Report .. *Progress Report of the Scheme for the Investigation of the Stem-Breaking Disease of Areca*, 1953–54.

PLATE-FIGS. 1–9. Figs. 1–3. Sunscorch effect on the stem (note the damage always on the same side). Fig. 4. A damaged palm longitudinally split during a gale. Fig. 5. Sporophore of *Ganoderma lucidum* (shown upside down). Fig. 6. Sporophores of *Polystictus* on the areca stem. Fig. 7. *Lenzites* sp. from areca. Fig. 8. Inoculated areca palm showing infection by *Ceratostomella paradoxa* in 10 weeks. Fig. 9. One method of protecting the tender stem by tying areca leaf-sheaths.