PLANT SANITATION.

Diseases of the Coconut Palm.

BY T. PETCH.

It is more or less axiomatic that the number of diseases to which a given plant is subject, and the virulence of such diseases if no special precautionary measures are taken, increase with the spread of its cultivation. It is rather surprising therefore to find from manuals and essays on coconut planting that there is apparently no disease of the coconut palm worthy of mention. This relative immunity is not confined to Ceylon, but, to judge from their publications, is shared by all other coconut growing countries. Insect pests are well known, and their treatment occupies a large part of the literature of the subject. Can it be that every disease has been attributed to "beetle," or is it that the climate of the coconut districts and the methods of planting really discourage the attacks of fungi? I think it may be assumed that the latter to a great extent are inimical to fungi in general. There have been alarming reports of coconut diseases in the past, *e.g.*, of leaf disease in Ceylon in 1889; but no very serious damage has been done, and the disease—or the fear of it—has passed away, and left no trace, not even a scientific record, nor a specimen by which it could be identified if it occurred again!

During the visitation referred to, it was generally stated that the particular disease was one which had been prevalent, but not serious, for a long time. Without a knowledge of fungi and a microscope such a statement in the case of a leaf disease could be only a mere guess. But I have now to record a disease, apparently of fungus origin, which really has existed for a long time, but which has only recently caused any serious injury or loss of trees.

This was first brought to the notice of the Department in 1903, but no information was left on record. Last year, a correspondent of the *Ceylon Observer* called attention to the condition of some of the palms near the Negombo Canal, and stated that "dead and dying palms were seen from the boat, between the second and fourth milestone on the canal. Sap was exuding from what appeared to be punctures on the stem made by an insect." In the early part of this year information to the same effect reached Peradeniya from several sources, and this particular locality was visited.

The affected trees are on a small island bounded by the canal and ditches, about a foot above the water level in the dry weather. The surrounding marsh is planted up in coconuts; these are remarkably stunted, so much so, that they resemble cycads. The diseased trees were covered to a height of seven or eight feet with black patches, caused by the exudation of sap from minute cracks in the outer tissue. The upper portion of the stem was usually unaffected. The tissue immediately beneath the crack becomes discoloured, generally brown at first and finally black, and this condition spreads internally until the patches from adjacent cracks coalesce. The whole of the interior of the trunk is ultimately reduced to a mass of humus mixed with fragments of the harder fibres. In advanced stages the tree bears only a few small fronds, but the "cabbage" is not diseased. The bud remains sound so long as a section of the stem shows a region of undecayed tissue. Several trees were dug up, and it was found that in general the roots were dead on the side affected; and as the material, both root and stem, brought away for microscopic examination did not show any fungus hyphæ, it was thought possible that the death of the trees was primarily due to the decay of the roots owing to the

unsuitable situation. It was quite certain that the beetle observed only bored into the stem after it was dead. In order to test this conclusion, the treatment which is detailed below was advised, but as far as I could judge when I passed the place some months afterwards nothing has been done.

Quite recently one of our leading coconut planters (who had raised the question of this disease in 1903) kindly offered to show me other localities in which the disease existed, and under his guidance more valuable information was obtained. In a plantation at Nalla, which was visited, two thousand trees are said to be affected, and though none have yet died, the number of diseased trees is increasing. It was seen that the ideas founded on the observations made previously on the palms near the canal would not hold good there, but fortunately a clue to the origin of the disease has been found in the specimens there collected. The longitudinal cracks in the outer tissue are a more or less normal feature of the coconut stem. They are not necessarily connected with disease, though it is probable that fungus enters through them. In the earliest stages of the disease, the sap oozes out from the trunk and causes a brown or black stain on the exterior. If the diseased region is cut into during wet weather a quantity of sap runs out. The tissue beneath the black patch decays, finally becoming dark brown or black. Instances of this appear to be fairly common. There are numbers of old trees on which the disease has been at work for years, doing no more harm than locally destroying the outer tissues, the hard wood below being apparently too dense for it to operate upon. A hole, filled at first with dry fibres, is left in the stem.

But in the cases which have attracted attention recently, the first black or rusty patch is followed by others, usually on the same side of the tree, and the diseased regions extend internally until the whole trunk is merely a shell enclosing a brown or black soil-like mass.

There is no doubt that the progress depends on the character of the tree, and older trees appear to be less affected. But trees of all ages are attacked, and the difference appears to depend on age only in so far as the older tree possesses a well-developed region of dense "wood." The trees which are killed succumb in from four to six years.

The fungus which is supposed to be the cause of the disease is wholly internal. Its spores are formed in the decaying tissue, and are brought to the exterior by the exuding sap. In order to have the disease under observation, inoculations were made at Peradeniya with diseased tissue, and with the sap containing the spores and some bacteria. But the only trees available at Peradeniya are extremely old, and it is as yet doubtful whether the infection has been successful. It is only by making pure cultivations of the fungus and inoculating the trees from them that certainty can be arrived at.

In addition to the Hendalla and Nalle districts, I have seen odd trees affected in the neighbourhood of Kandy. "The disease is fairly prevalent everywhere, but so far has not done any serious mischief. It seems to have increased of late in certain localities." "The progress of the disease is slow, taking possibly four to five years to kill the trees, but we think it is sufficiently serious to warrant attention." These are the opinions of our leading coconut planters.

The following measures were tried several years ago and have proved successful. All the diseased tissues were cut out and burnt, the wounds were then burned with a torch of rags dipped in oil, and then covered with hot coal tar. All dead coconut trees should be burned. With respect to the last point, the advice recently issued by the American Department of Agriculture in the Philippines may be quoted. "The first thing to do in coming into possession of a coconut grove, or in planting a new one, is to thoroughly clean the ground. All

manure heaps, rubbish, rotting or fallen trees should be removed and destroyed at once. Rubbish heaps and decayed trunks if fallen should be burned." Now that America has taken a hand in tropical agriculture, we may confidently expect that coconut diseases will receive full attention; they have been the first to recognise that such work in the Tropics requires an equipment, if possible, better than they have in America.

In the article on Coconuts in Watt's Dictionary of the Economic Products of India there is a reference to a stem disease which may be the same as the one we are at present concerned with; the information, however, is not very definite, and the suggested remedy does not invite recommendation. "Palms suffer from the attacks of an insect named *bhonga*, which gnaws the roots of the tree. When a palm is suffering from the attacks of *bhonga*, a dark red juice oozes from the trunk. When this is noticed, a hole three inches square is cut in the trunk from four to six feet above where the juice is coming out, and is filled with salt, which kills or drives away the insect." The recorder does not suggest how the salt reaches the supposed insect! The Sinhalese say that the disease is the work of "Taldiya," but what "Taldiya" is they cannot tell.

The other diseases of the coconut palm in Ceylon do not call for much attention. The "Bud Rot" described in Circular 15 has not been recorded from any other locality. A leaf fungus, *Pestalozzia palmarum*, is extremely common in the low country, but as it never kills a tree it is disregarded. Up country it seems to be much less common. As its name indicates, it is a relation of the "Gray Blight" of tea; indeed, if the labels were removed from mounted spores of the two species (and there is practically nothing but spores to lay hold of in a *Pestalozzia*), no one will be able to relabel them with any degree of certainty. Most coconut diseases have been attributed to the effect of *Pestalozzia palmarum*, probably because all palm fronds bear that fungus, and it therefore occurred on the supposed specimens of any disease which have been sent to Europe. In Ceylon, it is confined to small spots on the leaves, and though it must to some extent retard the growth of the tree, it does not cause diseases of the bud or stem. The West Indian Bud Rot is still stated by some to be caused by it.

A recent report from Java by Dr. Charles Bernard states that serious damage has been wrought by *Pestalozzia* in the case of young trees. In a plantation containing 5,000 plants, a year old, every tree was affected, more than half were so badly affected that there was no hope of saving them, and about 1,000 had died. Spraying with Bordeaux mixture is recommended, and is practicable in the case of young palms. Assuming that the cause of the disease is correctly determined, this offers a striking illustration of the possible differences in the effects of the same fungus on the same host in different countries.

Uprooting Jungle Stumps.

By T. Petch.

A correspondent writes from South India:—

"May I bring to your notice a plan carried out by a neighbour of mine, which is most successful. He first cuts down all the small trees; the large ones are then tackled. The roots round the tree are cut through, and the weight of the top boughs brings the tree down with a crash completely uprooting the stump. In the case of large round-topped trees, the branches on *one* side can be lopped, and the tree thus made to fall in any direction. This is in my opinion a much cheaper and more satisfactory method than first felling the tree and then digging up the stump. On the Nilgiris most of the forest trees are surface rooters, and I expect it is the same with you; this makes the plan I mention most efficient."

The method is, of course, not put forward as a new one, but it is one which might be adopted with advantage in future clearings.