

plant there is a certain acidity which is most favorable for the life processes of that species. Unquestionably in many cases soil acidity, by limiting the supply of lime available for plants, affects the acidity of the juice or protoplasm of these plants. The importance of a proper regulation of plant acidity in relation to vital plant processes should be noted.

"In the life processes of plants, acids are formed, some of which are probably simple by-products. Lime and other bases are needed to neutralise these acids. Plants high in protein are usually high in lime and other bases indicating the formation of acids in protein synthesis. If the supply of lime and other bases is inadequate, the acidity of the plant juice rises to a certain extent which is limited because the accumulation of acids probably decreases the rate of the processes which produce acids. A condition of self regulation thus probably exists and death due to over-acidity is prevented. Slow growth and a weakened condition however, result as is the case with plants of high lime requirement growing on acid soils.

"In plants there are many "buffer" substances which to a certain extent help to maintain a more uniform acidity and prevent rapid and excessive alterations, as would result especially from diurnal changes in plant processes. Bases are however usually needed in the formation of these "buffer" substances."

T. F. C.

Red Ring Disease of Coconuts.

The following extracts are taken from a report read by Mr. W. Nowell, D. I. C., Mycologist, Imperial Department of Agriculture, Trinidad on Oct. 16, 1919, and published in the "Agricultural News" Vol. XVIII, No. 460. It is considered it may be of interest to local growers of coconuts.

"It may be remembered that during my last visit I had incidental opportunities of making observations on the so-called root disease of coconuts, and announced the invariable association of the disease in all cases examined, with a minute thread worm or nematode. The matter was not then sufficiently advanced for the issue of a report, and the investigation is still far from complete.

In the first place it must be stated that the connexion of the disease with the nematode worm has been abundantly confirmed. Not only is the worm present in close association with the first appearance of the disease in any organ of the plant, but infection experiments, with material to all appearances pure have resulted in complete and typical infestation of the inoculated trees with the reproduction of all the symptoms of the disease, the parallel controls remaining healthy. The proof cannot be considered absolute, but it comes nearer to certainty than is the case with very many plant diseases in which causation is regarded as established.

"The worm has been described as a new species, *Aphelenchus cocophila*, by Dr. N. A. Cobb, of the United States Department of Agriculture, who has prepared a paper on its characteristics for the forthcoming number of the West Indian Bulletin.

"It is now clear that the existence of the disease in the roots, though fairly general, is only secondary. Examples have been seen in which the roots were affected only in the slightest degree. The centre of infestation is the red zone in the stem, which is simply a vast breeding ground of the worm. From this it extends more or less along the roots, and, what is much more serious in immediate results, to the leaves. This includes not only the mature and semi-mature leaves which progressively fail in the familiar manner, but the very youngest rudimentary leaves, only a few inches long, in the centre of the bud. It appears to be this infestation of the leaves which brings about the death of the tree. In plantations where the trees are uniform in age, the disease typically appears first in widely and thinly scattered cases when the trees approach bearing age. This can occur equally on virgin forest soil or on old cultivated land. The worms may come from some unknown alternative host, not coconut, but the balance of probability seems at present to be with the conclusion that they are introduced with the seed nuts.

"From the centres of infection thus established, the disease extends to surrounding trees, and the resulting losses can be very serious. I have already seen or heard of several instances in which they approached 30 per cent.

"The process of natural infection, and the length of time required for development remain to be investigated. Three trees in Grenada inoculated in the stem 1 to 2 feet from the ground were fully infested and failing in sixty days. A tree inoculated in the stalk of a leaf had a rather general but not fully developed infestation in seventy-four days. A tree in which material was placed among the leaf bases without inoculation was fully infested in stem and leaves in seventy-four days, while a tree similarly treated in one leaf base had seventeen infested leaves at the end of the same period.

"It thus appears that infestation may take place among the leaves without previous injury and this can be conceived as quite possibly occurring from dry infected material blowing about or from worms gaining access to the leaf bases of young trees from the soil. There is a large amount of detail work remaining to be done with regard to the resistance of the worms to dryness and to chemical agents, to their distribution and longevity in the soil and other matters. This work is of an obvious kind, and, given the opportunity there is every prospect of approaching to a fairly complete knowledge of the disease within a reasonably short time.

"It is clear that the only hope of control lies in prevention and not cure and the bigger practical difficulty is going to be the disposition of the vast amount of infested material which the dying trees contain."

T. F. C.