

## Natural Immunity of Rubber Trees to Bark Rot.

**R. H. STOUGHTON-HARRIS, B.Sc., A.R.C.S.,**

*Mycologist, Rubber Research Scheme, Ceylon.*

**I**N the course of some experiments carried out on the control of Bark Rot by disinfectants applied to the tapping-cut, observations of the same trees on two successive years gave reason to believe that on the whole the same trees which were infected by Bark Rot one year tended to be re-infected the next year, while those not attacked remained free the following season. It was apparent that this was not strictly the case, but there appeared to be more trees attacked both years than would be expected on a chance or random distribution of infection.

A careful analysis of the actual numbers of cases bears out this conclusion and it is intended in this article to give a summary of the analytical results obtained.

A detailed description of the experiments is not necessary, and has been given elsewhere, but an outline of the design is essential for an undertaking of the tables which follow.

A plot of 1,440 trees was divided up into four blocks of eighteen rows, each row containing twenty trees. To the trees in each of the rows in the first block was applied a different disinfectant, and these treatments were repeated in the remaining three blocks, so that in all eighty trees were treated with each of eighteen disinfectants (more precisely seventeen, as one row in each block was left untreated to serve as a control). The experiment was carried out during the S. W. Monsoon period of 1925 and repeated in the same season of 1926. All trees were tapped on a  $\frac{1}{2}$ -cut every third day during 1925 and on alternate days in 1926. The practice on the estate is to change-over the

cuts to the opposite sides of the trees twice a year, so that the same panel was in tapping in both experiments, except in those cases where a new cut had to be opened in 1926.

Examinations of every tree for Bark Rot were made twice in the 1925 experiment (July and August) and once in 1926 (August). In the examinations all trees which showed more than one or two black lines along the tapping-cut were considered as diseased.

In the analysis of the figures which follows all trees which were out of tapping in either year for any cause other than Bark Rot are left out of the count, so that in each block there is a total of less than 80.

Now, assuming that all trees were equally susceptible to Bark Rot it would be expected that on the whole the distribution of infection in 1926 would be proportional to the infection in 1925. For example, suppose in any one block of four rows treated alike, there was 75 per cent. of infection; that is to say 60 trees infected and 20 uninfected out of the total of 80 (assuming all to be in tapping). Then suppose that in 1925 there were 40 trees attacked by Bark Rot (50 per cent. infection). Then if the chances of infection are equal it would be expected that of these 40, 75 per cent. would be trees that had been attacked in 1925 and 25 per cent. of "new cases." That is 30 of the 1926 cases should be on trees attacked in 1925 also, and 10 should be on trees free from Bark Rot in 1925. This exact distribution would never, of course, be found, but it is possible by statistical methods to show what deviation from the expected results may be regarded as significant.

For the purposes of the analysis it is necessary to know the total number of cases in 1925, the percentage infection that this represents, in the same figures for 1926, and the number of cases occurring on the same trees in both years. From the first four may be calculated the expected distribution, and this may be compared with the last, the observed distribution. The actual results

are as follows:—

Row	Total cases 19'5	Total un-attacked 1925.	Percentage of Bark Rot	Total cases 1926.	Total un-attacked 1926.	A.	B.	C.
A.	47	21	69	27	41	19	23	+ 4
B.	45	25	64.5	25	45	16	18	+ 2
C.	46	26	64	24	48	15	16	+ 1
D.	51	17	75	32	36	24	27	+ 3
E.	44	28	61	32	40	20	21	+ 1
F.	56	13	81	41	28	33	35	+ 2
G.	49	23	68	28	44	19	21	+ 2
H.	42	29	59	32	39	10	21	+ 2
J.	55	17	76.5	23	49	18	19	+ 1
K.	48	19	72	30	7	21	25	+ 4
L.	50	21	70.5	24	47	17	21	+ 4
M.	51	21	71	25	47	18	19	+ 1
N.	42	23	64.5	33	32	20	26	+ 6
O.	53	23	70	27	49	19	22	+ 3
P.	45	23	66	23	45	15	20	+ 5
R.	38	28	57.5	24	42	14	17	+ 3
S.	41	25	62	19	47	12	14	+ 2
T.	56	16	74.5	30	42	23	27	+ 4
Total.	859	398	68	499	758	342	392	+ 50

Column A shows the number of trees expected to be infected both years assuming a chance distribution of infection. Column B gives the number of such cases actually found. Column C gives the difference between the expected and the observed results.

It will be seen that a total of 50 more trees were attacked in both years than would be expected if all trees were equally susceptible. Similarly, of course, there were 50 fewer "new cases" than would be expected. The important point to note, however, is that in *each* of the eighteen sets an excess is found for the observed over the expected. Now if the chances of attack of all trees were equal positive and negative signs should occur in the last column with equal frequency. It may be shown from what is known as the "binominal distribution" that all will be of the same sign, by chance, only twice in 262,144 trials. There is, therefore, no doubt whatever that the observed distribution is very significantly different from the expected.

The cause of this discrepancy must obviously lie in the fact that certain trees are more or less immune to Bark Rot, or at least they show greater resistance to the disease.

At first sight it may be objected that the results are upset by the difference in treatment of the trees, but it will be seen that this really has no effect upon the results, for the different treatments are each considered separately and have no bearing upon each other, and the ratios are left unaffected.