

## A MANURIAL EXPERIMENT WITH CACAO

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**A** CACAO manurial experiment at Peradeniya was brought to a conclusion on March 31st, 1931.

The plan of the experiment was as follows:

Sixteen plots of approximately one acre each were used, and these were divided into four groups of four plots each, each group containing one plot of each treatment. Each plot was given a letter denoting the treatment, followed by the permanent number of the plot. The four treatments were:

A plots 250 lb. Superphosphate per plot per annum.

B ,, 100 lb. Muriate of Potash per plot per annum.

C ,, 250 lb. Superphosphate and 100 lb. Muriate of Potash per plot per annum.

D ,, (Control). No manures, but the same cultural treatment as the manured plots.

All manures were applied in the month of January each year and were lightly forked in with mamoty forks. The D plots received a similar light forking at the same time.

In each group the control plot (D plot) was not selected by randomisation but the plot which had given the highest average yield over the four years prior to the first application of the manures was taken.

Records were maintained of the wet weights of good and black cacao in each plot and these figures were converted into good dry and black dry weights at 38 per cent and 21 per cent respectively; these figures being the actual average out-turn in each grade over a period of six years. Conclusions were to be based on the average annual yields of the A, B, and C plots relative to the D plots without manures during the four cacao years 1923-24, 1924-25, 1925-26, and 1926-27, compared with the average annual yields of the A, B, and C plots relative to the D plots with manuring in the four cacao years 1927-28, 1928-29, 1929-30, and 1930-31. In other words, since the D plots were in each group the highest yielders in the first period it was intended to see whether the lead of the D plots over the A, B, and C plots was reduced by manuring the latter. In addition to yields, the intention was to study the effect of manuring on pod canker incidence by comparing the proportion which good cacao formed of the total crop in the two periods.

The total yields of good and black cacao will first be considered in tables I, II, and III. To avoid presenting a bewildering mass of figures, only the average yield of the four years in each period are shown. The yields of the four plots (one in each group) which have received the same treatment are shown together.

**Table I**

Yields of plots manured with 250 lb. of Superphosphate per acre per annum.

Plot	Average annual yield of dry cacao in unmanured period	Percentage increase or decrease over control plot in same group	Average annual yield of dry cacao in manured period	Percentage increase or decrease over control plot in same group	Difference of percentage increase or decrease over control plot in manured period compared with unmanured period
	lb.		lb.		
A5 (Group 1)	370	-13.6	351	-28.0	-14.4
A9 ( " 2)	364	-23.2	410	-9.3	+13.9
A115 ( " 3)	457	-6.1	476	-4.6	+1.5
A9/ ( " 4)	369	-30.6	511	-34.2	-3.6
Average	390	-18.4	437	-19.0	- .6

From these figures it would appear that although in two plots, A 9 and A 115, a reduction has been effected in the decrease over the control plot, in the other two plots, A 5 and A 91, the decrease has been further accentuated and the indication is that the application of superphosphate has on the average failed to improve the position of these plots relative to the control plots.

**Table II**

Yields of plots manured with 100 lb. Muriate of Potash per acre per annum.

Plot	Average annual yield of dry cacao in unmanured period	Percentage increase or decrease over control plot in same group	Average annual yield of dry cacao in manured period	Percentage increase or decrease over control plot in same group	Difference of percentage increase or decrease over control plot in manured period compared with unmanured period
	lb.		lb.		
B 4 (Group 1)	387	-13.6	304	-37.5	-23.9
B 95 ( " 2)	405	-14.4	562	+24.4	+38.8
B114 ( " 3)	463	-4.9	429	-14.0	-9.1
B 90 ( " 4)	389	-26.9	470	-39.4	-12.5
Average	411	-14.9	441	-16.6	-1.7

In this case also, though a substantial improvement has occurred in B 95, on the average the manured plots are left even further behind the control plots.

**Table III**

Yields of plots manured with 250 lb. of Superphosphate and 100 lb. of Muriate of Potash per acre per annum.

Plot	Average annual yield of dry cacao in unmanured period	Percentage increase or decrease over control plot in the same group	Average annual yield of dry cacao in unmanured period	Percentage increase or decrease over control plot in same group	Difference of percentage increase or decrease over control plot in manured period compared with unmanured period
	lb.		lb.		
C109 (Group 1)	425	- 0.7	472	- 3.1	- 2.4
C8 ( " 2)	422	- 10.9	403	- 1.9	+ 9.0
C116 ( " 3)	474	- 2.6	485	- 2.8	- 0.2
C 92 ( " 4)	472	- 11.3	710	- 8.6	+ 2.7
Average	448	- 6.4	517	- 4.1	+ 2.3

Once again we find that in two plots the yields have fallen still farther behind those of the controls, while in the other two plots an improvement has taken place. On the average the relative yields of the plots have improved by 2.3 per cent.

The experiment affords no valid evidence that yields have been increased by the application of either superphosphate, muriate of potash, or a mixture of the two.

It is true that this percentage-increase method is not considered a reliable one, but it is reasonable to suppose that, if the application of the manures had exerted any influence, a greater change in the relationship of the yields of the manured plots and those of the control plots would have appeared. In this connection it is of interest to note Lock's <sup>(1)</sup> summing up of the results of cacao manuring experiments carried out on the station between 1902 and 1911. He says: "We find, therefore, that the differences of crop which can be attributed to the action of definite chemical constituents are extremely slight, and it seems clear that the continued application of most artificial manures to a cacao soil like that of Peradeniya is a waste of money, under the conditions of this experiment."

The present writer made some remarks on this point in the Progress Report for the Station for the months of May and June, 1930. The following is the extract referred to:

“The yields of dry cacao per acre for the last seven years have been as follows:

Year	Cwt. per acre of dry cacao	Rainfall
1923-24	... 2·24	106·42
1924-25	... 3·10	103·82
1925-26	... 5·45	87·31
1926-27	... 5·03	98·11
1927-28	... 4·41	80·33
1928-29	... 2·49	88·95
1929-30	... 4·58	98·71

“From 1921 to January 1928, no manures were applied to the cacao. From January 1928, twelve out of the forty-one acres of cacao have received phosphatic and potash manures in accordance with the manurial experiment now in progress. The above yields tend to show that cacao yields fluctuate far more with the season than as the result of any manurial treatment.”

To sum up it appears more than likely that there is no deficiency of phosphoric acid or potash in these soils and that in consequence the application of the manures has exerted no obvious effect.

One notable point is that all the three manured plots in group 2 show an improvement in yield relative to the control plot while no plot shows an improvement in group 1, and only one plot each in groups 3 and 4. This is difficult to explain. The plots which comprise group 2 are some of the best on the station and there is no obvious reason why they should have benefited more by the application of the manures than the plots in the other groups.

It is now necessary to examine the question of disease incidence. The average percentages of good cacao of total crops in the two periods are found in table IV for all three treatments.

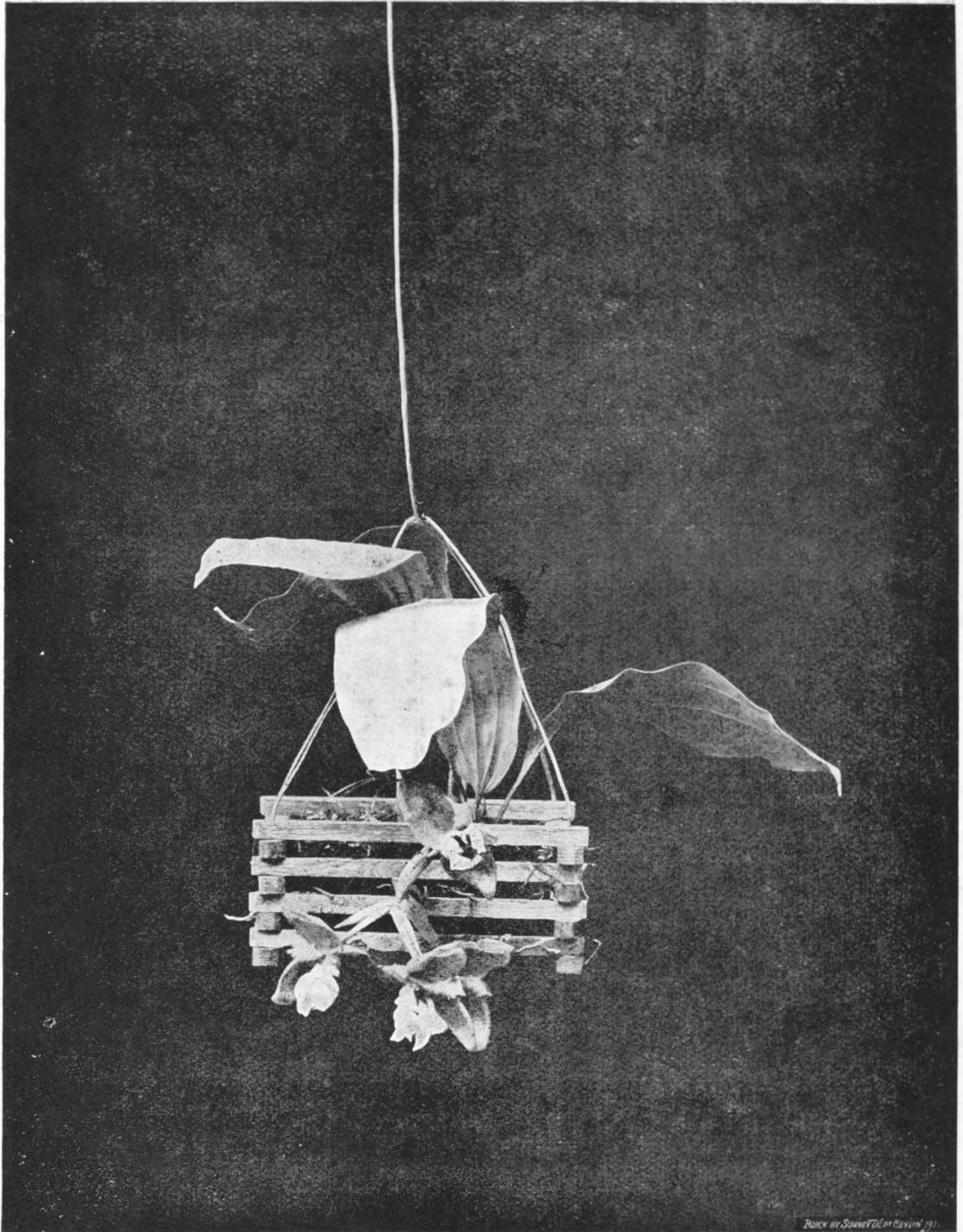
Table IV

Plot	Average percentage good cacao of total crop in manured period	Same figure for control plot in same group	Increase or decrease in percentage good cacao over control plot	Average percentage good cacao of total crop in manured period	Same figure for control plot in same group	Increase or decrease in percentage good cacao over control plot	Average percentage good cacao of total crop in manured period	Difference of percentage relative to with control plot for manured period compared with unmanured period
A 5	76.2	76.4	-.2	73.0	81.0	-8.0	73.0	-7.8
A 9	76.1	75.5	+.6	78.0	76.6	+1.4	78.0	+.8
A 115	79.2	78.9	+.3	79.0	83.2	-4.2	79.0	-4.5
A 91	77.5	79.5	-.2	82.1	85.0	-2.9	82.1	-2.7
Average	77.2	77.6	-.4	78.0	81.4	-3.6	78.0	-3.2
B 4	77.2	76.4	+.8	76.4	81.0	-4.6	76.4	-5.4
B 95	74.3	75.5	-1.2	83.1	76.6	+6.5	83.1	+7.7
B 114	78.4	78.9	-.5	83.0	83.2	-.2	83.0	+.3
B 90	71.5	79.5	-8.0	82.3	85.0	-2.7	82.3	+5.3
Average	75.3	77.6	-2.3	81.2	81.5	-.3	81.2	+2.1
C 109	77.3	76.4	+.9	80.2	81.0	-.8	80.2	-1.7
C 8	73.7	75.5	-1.8	79.3	76.6	+3.3	79.3	+5.1
C 116	81.4	78.9	+2.5	78.1	83.2	-5.1	78.1	-7.6
C 92	77.9	79.5	-1.4	83.6	85.0	-1.4	83.6	nil
Average	77.6	77.6	nil	80.3	81.4	-1.1	80.3	-1.1

If the application of manures has failed to increase the total yield it would appear unlikely that it would result in an increase in the proportion of good cacao, and from the figures in table IV this does not in fact seem to have occurred. The relative position of the superphosphate plots compared with the control plots as regards proportion of good cacao is worse by 3·2 per cent than before manuring. The muriate of potash plots show a small improvement of 2·1 per cent but the plots which have received both these manures show a deterioration of 1·1 per cent. There is little doubt that no influence has been exerted on the incidence of pod canker.

#### LITERATURE CITED

- (1). Lock, R. H.—Report on Experiments in Manuring Old Cacao, carried out at the Experiment Station, Peradeniya, between 1903 and 1911.—*Circ. and Agric. Journ. R. B. G., Ceylon.* Vol. VI, No. 4.



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