CROP PROTECTION DURING PLUCKING.

C. A. LOOS.

Definite progress has been made with the control of blister blight as a result of our investigations into the exact nature and course of the disease. For instance the knowledge that the majority of infections take place through the upper surface of the leaf made possible the reduction of spray applications from 50 gallons and more per acre to the more economical output of 12—15 gallons.

To avoid confusing results by trials with more than one copper fungicide it was decided to confine our experimental work, in its initial stages, to one proprietary formulation — Perenox — against which other formulations may be judged when the opportunity arises. Perenox, in the experiments I shall review, was made up at the concentration of 4 ounces in 10 gallons of water; the concentration we recommend for the control of blister blight.

Before large scale experiments in the protection of tea in plucking could be planned, we were faced with two very important problems —

(a) the maximum interval between spray applications for effective control,

(b) copper residues in the manufactured tea.

To determine the answer to these problems an accurately laid out experiment, known as the St. Coombs No. 9 Field Crop Protection Experiment, was started on an area of tea pruned in December 1948. Since recovery took place during the dry weather spray protection was unnecessary after pruning. The area is divided into four blocks, each of which consists of three treatments — weekly and fortnightly sprayings with Perenox, and an unprotected plot. Each plot in the block consists of a double row of 50 bushes, on either side of which two guard rows of tea are allowed to grow up as a protection against spray drift between treatments. The four replications, which are on a randomised basis, contain 400 bushes or extend through one eighth of an acre.

The accuracy of the lay out of this experiment may be gauged from the crop returns for the first five pluckings before blister blight caused damage.

TABLE 1.

St. Coombs No. 9 Field Crop Protection Experiment.

Crop returns expressed as lbs. made tea per treatment.

Pluck No.	Unprotected plot lbs.	Weekly protected plot lbs.	Fortnightly protected plot lbs.
1	2.8	2.8	3.2
2	1.8	1.5	1.8
3	1.4	1.7	1.6
4	0.5	0.4	0.4
5	0.9	1.0	1.0
Total for 5 plucks	7.4	7.4	8.0

The experiment completes its second year in the cycle at the end of this month. Table 2 sets out the yield returns and costs of spraying for the two years under review.

TABLE 2.

St. Coombs No. 9 Field Crop Protection Experiment.

Crop returns and costs of spraying for the years 1949 & 1950.

	Yield expressed as lbs. made tea per acre			Increase in yield over unprotected plots		Total number of sprayings	
	Unprotected	Protected weekly	Protected fortnightly	Protected weekly	Protected fortnightly	Weekly	Fortnightly
1st year from Pruning (1949) 23rd May to 31st Dec.	328.8	414.4	410.0	85.2 (+26%)	81.2 (+25%)	29	15
2nd year from Pruning (1950) 1st Jany. to 11 Nov.	534.0	702.2	665.2	168.2 (+31.5%)	131.2 (+24.6%)	30	16

Although in 1949 protection at fortnightly intervals gave almost as good results as weekly protection, it has to be borne in mind that blister blight was not particularly severe in that year. Even then weekly protection of this first year field proved profitable as 85.2 lbs. of made tea per acre was obtained as the result of 29 sprayings at a cost of Rs. 65.25. In the monsoon of 1950, this year, blister blight was more severe with the result that fortnightly protection has not been as effective as weekly applications. We gained an extra crop of 168.2 lbs. made tea per acre at the cost of Rs. 67.50 for weekly protection and 131.2 lbs. at the cost of Rs. 36 when spraying was on fortnightly rounds. As no one can safely predict weather conditions or the intensity of blister blight attacks early on in the monsoon, I consider it will be playing on the safe side by fixing the spraying intervals at a suitable point between 7 and 14 days.

In the experimental area it is quite simple to point out the sprayed and unsprayed plots from the visual appearance of the bushes alone. The weekly sprayed plots show magnificient tea while the unsprayed bushes are small in comparison and carry a large amount of defoliated shoots. It is very obvious that the yielding capacity of the sprayed bushes is far above that of those which have remained unprotected.

The build up of blister blight infections on unprotected tea may be correlated with weather conditions and the intervals taken in the formation of the white sporing blister. In the last two years we started the monsoons with no apparent translucent spot infections on flush points. A translucent spot or the first visual indication of infection, as Mr. Lamb has already explained, is visible 8—10 days after the penetration into the leaf of the infection tube from a germinating spore. A further interval of 7 to 10 days elapses before the translucent spot becomes a white sporing blister from which large numbers of viable spores are freed into the air. An interval, therefore, of 18—19 days intervenes between one crop of translucent spots and the next which are the direct result of that first crop maturing to the white blister stage. An initially rapid, followed by a steady incremental build up, is shown clearly by the counts of infections on flush at the commencement of the south west monsoon this year.

TABLE 3.

St. Coombs No. 9 Field Crop Protection Experiment.

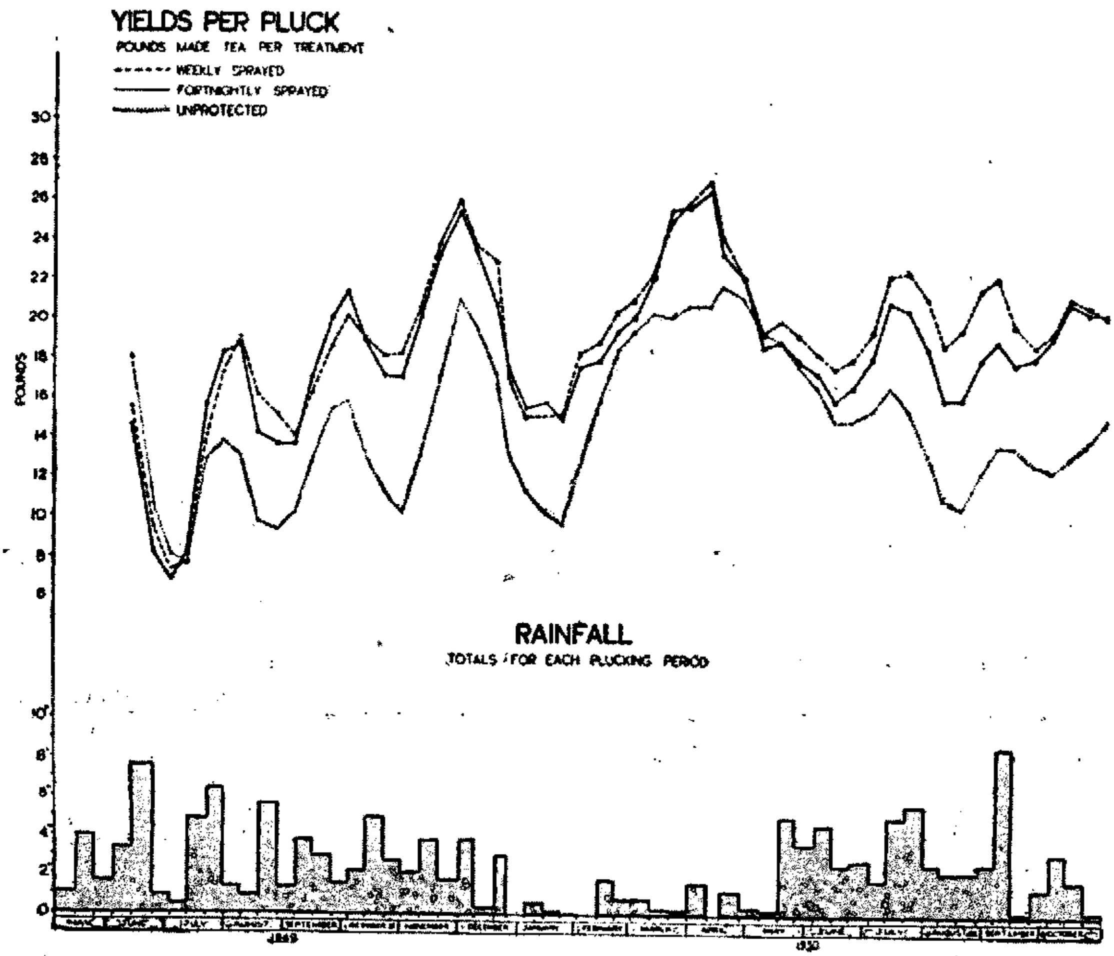
Build up of blister infections on unprotected plots.

Date of Pluck	Percentage flush infections — translucent spots.	Rainfall between plucks	Rainy days between plucks.
		inches.	
10/5/50	0	0.69	3
19/5/50	2	0.02	1
29/5/50	2	7.67	7
7/6/50	45	1.67	8
16/6/50	50	4.35	7
26/6/50	70	3.12	10
5/7/50	98	2.51	9

19/5/50 — 7/6/50 — 19 days.
7/6/50 — 26/6/50 — 19 days.

FIG. I.

WET SPRAYING OF TEA IN PLUCKING
ST. COOMBS. No 9 FIELD.



Legend : Graph showing yield trials for the years 1949 and 1950.

Fig. 1 shows that a period of about six weeks elapses between the start of the monsoon in May and the first evidence of crop losses. Those losses are directly attributable to the heavy spore output from the millions of blisters which mature under suitable weather and growing conditions. If one realises that a single blister may produce 2—3 million spores, the output from blisters on one acre alone is beyond comprehension. The loss of blister susceptible material by die back following stem attacks causes the reduction in the number of infective white blisters with the result that crop forges ahead again in late July and early August. That rush of crop is, however, shortlived as fresh infections and a rapid build up of a new lot of blisters gives rise to the second severe loss in crop. These two attacks coming close on each other are responsible for a reduction of flushing points and infection of young axillary buds.

With wet spraying at reasonable intervals this infection of axillary buds does not occur even though white blisters may be fairly evident in the field. This may be accounted for by the fact that most run off from the sprayed leaf surface is along the leaf stalk or petiole and over the axillary bud which thus becomes well coated with the fungicide.

The potential cropping capacity of a tea bush depends to a great extent on its health and spread. A field which has an almost continuous cover of tea must yield far more crop than one through which a man may walk between the rows without difficulty. Yet it is possible, for a few years, to take as much crop from one as from the other. That crop from the smaller bushes is, however, at the expense of capital and the day must eventually arrive when the capital pays no more dividends. If tea culture is to continue it is essential that capital value or bush health must be conserved.

Capital depreciation is indicated from the trend of crop yields on my No. 9 field experiment. During the period December to early May blister blight on St. Coombs is at a very low level and it is then that unprotected bushes should find it possible to forge ahead and make crop while the sun shines. This does not happen. Bush spread was limited during blister attacks with the result that even under favourable growing conditions crop continued to lag behind that of areas protected during the monsoons. Weather conditions in the early part of 1950 had been suitable for heavy cropping in March and April but as you see on the graph (Fig. 1) the cropping capacity of the unprotected plots must have been seriously diminished as they were unable to support the same yield as the plots which had received spray protection in the previous year. It is too early to forecast what the yield trend will be in the 3rd year (1952) but judging from the size of the unprotected bushes it seems possible that the effect will be even more marked.

To reduce copper residues in manufactured tea to a minimum it is advisable to spray fields as soon as possible after plucking in order to allow the maximum number of days between a spray application and the subsequent pluck. The indication from the experiment I have just described is that spraying at intervals of between 7 and 14 days will give effective control of blister blight. Thus a spraying interval of 9 to 10 days based on the usual estate practice of plucking on 9 day rounds should prove satisfactory.

In 1950 it was decided to repeat this experiment on a much larger scale. Accordingly the St. Coombs No. 8 field Crop Protection experiment was commenced in May 1950 on an area pruned lightly in December 1949 and brought into tipping without spray protection. The area is divided into three plots A, B, and C, each approximately 2½ acres in extent.

It is unfortunate that we could not afford the labour and supervision to lay this large experiment down as a properly replicated field experiment. Nevertheless the plots were carefully chosen for uniformity and bush counted. The yields from each plot before blister blight attacks commenced indicated that reasonable uniformity had been achieved. Pluckings are at 9 day intervals for three consecutive plucks but every 4th pluck is on a 10 day round to avoid the extra cost of plucking on a Sunday.

Plot A.—Control. Unprotected with fungicides.

Plot B.—Spraying with Perenox was commenced on 2nd May, the day following tipping. Sprayings will continue at 9 and 10 day intervals through both monsoon periods but will cease in January when the usual dry weather sets in.

Plot C.—Sprayed as for Plot B until September 9th when spraying ceased. Crop returns from this plot show the results of protection under S. W. monsoonal conditions only.

Application rates with Perenox range between 10 and 13 gallons per acre.

Severe losses in crop were evident from 14th July in the unprotected plot in comparison with the two sprayed plots B and C.

TABLE 4.

St. Coombs No. 8 Field Crop Protection Experiment.

Crop returns expressed as pounds made tea per acre for the period 14/7/50 to 8/9/50.

Plucking date.	Unprotected A. lbs.	Protected at 9-10 day intervals B. lbs.	C. lbs.	Increase of crop over unprotected plot A B. lbs.	C. lbs.
14th July	6.1	18.9	25.1	12.8	19.0
24th „	7.9	25.1	22.7	17.2	14.8
2nd Aug.	4.9	17.9	21.6	13.0	16.7
11th „	7.8	19.9	20.5	12.1	12.7
21st „	8.7	17.7	16.2	9.0	7.5
30th „	7.4	9.4	7.8	2.0	0.4
8th Sept.	11.8	14.9	14.5	3.1	2.7
Total 14/7/50 to 8/9/50	54.6	123.8	128.4	69.2	73.8

The cessation of spraying of plot C on 9th September was obviously too early. By 16th October white blisters were very evident, and crop started to decline on 25th October. On 3rd November yields from Plot C were below even that of the control plot A though 10 days later, following the effect of better growing weather, Plot C yields increased again but were still below that of the area regularly sprayed.

TABLE 5.

Crop Protection Experiment St. Coombs No. 9 Field.

The effect of cessation of spraying on 9th Sept.

Plucking dates	YIELDS EXPRESSED AS LBS. MADE TEA PER ACRE Plot A Unprotected lbs.	Plot B Sprayed every 10 days. lbs.	Plot C Sprayed every 10 days until 9/9/50 lbs.
8th Sept. '50	11.8	14.9	14.5
18th „	5.3	11.6	12.3
27th „	5.6	17.7	18.1
6th Oct.	6.9	32.0	31.0
16th „	9.8	22.9	21.3
25th „	12.9	23.0	19.3
3rd Nov.	19.0	20.9	13.8
13th „	20.4	28.4	23.3

Whether or not the effects of the cessation of spraying will continue to have an adverse effect on crops and bush health still remains to be proved. Visually plots B and C are equally good.

For the whole period under review, 19th May to 13th November 1950, crop returns for the 3 plots are set out in Table 6.

TABLE 6.

St. Coombs No. 8 Crop Protection Experiment.

Crop returns expressed as pounds made tea
per acre and spray applications for the
period 19/5/50 to 13/11/50.

	Crop returns. lbs.	Increase in crop over A. lbs.	No. of sprayings	Total cost of sprayings.
Plot A. Unprotected	234.5	—	0	0
Plot B. Protected every 9-10 days throughout	407.8	172.7	22	Rs. 49/50
Plot C. Protected every 9-10 days up to 9/9/50	383.7	149.2	13	,, 37/50

Many of you have seen the experimental area during the recent demonstrations on St. Coombs. To those who have not the colour slides which you will now see may give an indication of the visual difference between the sprayed and unsprayed plots. Protection has certainly given an area of tea which approximates in appearance the field we knew before blister blight commenced its ravages.

This field has given a spectacular increase in yield as a result of spraying I have explained that it is not a replicated field experiment and the fact that an 80% increase of yield has been achieved over the severe blister blight period from May to October must not be over emphasised. Spraying has actually shewn a profit. The indications are that spraying would have paid for itself even though yields and prices were much lower. The real value of this experiment, however, lies in the capital value of the protected bushes. Only a visit to the area can demonstrate this point effectively but we maintain that the principal benefit of spraying first year tea in plucking will result from the protection of the capital value of the bushes.