STUDIES IN BLISTER BLIGHT CONTROL

XII. DUSTING AND SPRAYING AGAINST BLISTER BLIGHT ON URY GROUP, PASSARA

C. A. Loos

Introduction

A power-dusting experiment to ascertain the efficacy of "Cuprosana" copper fungicidal dusts of 2, 4 and 6 per cent copper content, was conducted on Dessford Estate, Nanu Oya, during the south-west monsoon months in 1950. The full results of that experiment have been published in the *Tea Quarterly* [1]. Using the "Whirlwind" power duster we had definite indication of effective blister blight control, with the 4 and 6 per cent "Cuprosana" formulations, provided an adequate distribution of copper in the dusts was possible, and application rates were 5 lbs. an acre at 5 day intervals. It was also clear that adequate distribution of copper was confined to a band 25 yards from the machine with 4 per cent, and 50 yards with 6 per cent "Cuprosana". These results confirm Haworth's [2] conclusions of the rapid fall in the distribution of copper from a cloud of copper fungicidal dust, as the distance from the dusting point increased.

The promising results achieved with 4 per cent "Cuprosana" indicated that, by a more suitable and effective means of distributing the dust, economical control of blister blight may be possible in areas where water for spraying is not easily accessible or labour shortage is a factor to be considered. The experiment reviewed in this article compares the control of blister blight in tea with 4 per cent. "Cuprosana" dust applied by means of power duster or hand duster with wet spraying by means of knapsacks.

The areas selected for the experiment were two fields, Nos. 7 and 8, totalling 116 acres 2 roods 35 perches, on the Mahapahagalla Division of Ury Estate, Passara (Elevation 3,500—4,200 feet).

Each field was divided into four blocks, each block receiving one of the following treatments:—

(a) 4 per cent "Cuprosana" dust at approximately 5 lbs. per acre through hand dusters. The operators walked through the tea dusting bands 5 rows wide (approximately 15 feet).

(b) 4 per cent "Cuprosana" dust at 5 lbs. per acre every 5 days through the "Whirlwind" power duster. Dusting was done from roads and footpaths only.

(c) Wet spraying by means of the "Vermorel" knapsack sprayer with "Perenox" at a concentration of 4 ounces in 10 gallons water applied at approximately 15 gallons per acre at 10 day intervals.

(d) Unprotected with either dust or spray.

Field No. 8—43 acres 2 roods 18 perches. A first year field of fairly high jat tea pruned and tipped on the slope.

Hand dusted	16.5 acres
"Whirlwind" dusted	20.0 „
Sprayed	5.75 „
Unprotected	1.33 „

Field No. 7—73 acres 17 perches. A second year field of fairly good hybrid tea; level pruned.

Hand dusted	16.5 acres
"Whirlwind" dusted	25.0 ,,
Sprayed	9.0 ,,
Unprotected	6.0 ,,

A 5½ acre block of this field remained outside the experiment.

Duration of Experiment. The experiment commenced on September 27th, 1951 and continued until the end of September 1952 during which time crop returns from individual treatments were recorded. Protection with fungicides commenced on September 27th, 1951, and continued until the end of the north-west monsoon rains on February 20th, 1952.

Crop Returns. This may be divided into three categories:—

(1) Plucks 1 - 7 (October 4th, 1951 to December 4th, 1952) which may be considered to be the period before blister blight built up sufficiently to cause loss of crop.

(2) Plucks 8 - 14 (December 5th, 1951 to February 11th, 1952) when the effects of blister blight caused die-back and loss of crop.

(3) Plucks 15 - 40 (February 12th, 1952 to October 8th, 1952) or the post blister period.

It should be clearly borne in mind that in the power dusting experiment in which the subsequent carry of the dusts for long distances cannot be controlled, replication of treatments necessary for statistical analysis of yields is not possible. Yield returns on this experiment are, therefore, of little significance except as an indication of probable losses due to blister blight. No allowance can be made of inherent variability of bushes or for the possible range in character of soil fertility between plots. That could only be done on sufficient replications of treatments which in the present case was not possible. We have, therefore, to rely on marked differences in crop returns showing up between treatments for any reliable indication of superiority of control between spraying and dusting or in the method of application of the dust.

In tables 1 and 2 the yield capacity per acre for the pre-blister period (plucks 1-7) has been assessed at 100 and the yield capacity during the blister and post-blister periods compared with it on the basis of that assessment.

Table 1. *Field No. 8. (First year field) crop returns for period 4th, October, 1951—8th, October, 1952, expressed as yield capacity compared with pre-blister period.*

Pluck No.	"Whirlwind" dusted	Hand-dusted	Sprayed	Unprotected
1 - 7 (pre-blister)	100	100	100	100
8 - 14 (blister period)	86	77	79	38
15 - 40 (post-blister period)	148	152	157	107

Table 2. *Field No. 7 (2nd year field) crop returns for period 4th, October, 1951—8th, October, 1952, expressed as yield capacity compared with pre-blister period.*

Pluck No.	"Whirlwind" dusted	Hand-dusted	Sprayed	Unprotected
1 - 7 (pre-blister)	100	100	100	100
8 - 14 (blister period)	67	79	80	46
15 - 40 (post-blister period)	119	122	122	131

Both fields showed a decided fall in crop on the unprotected areas during the blister blight period (plucks 8-14), the first year field (No. 8) being more severely affected than the field in the 2nd year of its cycle (Field No. 7). In the post-blister period, however, the unprotected area of No. 7 field (2nd year field) had recovered sufficiently to give a yield potential as high or higher than on the protected areas (131 compared with 119-122). On No. 8 field (first year field) the yield capacity on the unprotected area had definitely been affected by the severe blister blight attacks as during the post-blister period the yield potential was only 107 compared with 148-157 on the protected areas. On these figures we may assume that it is necessary and economic to protect 1st year fields though protection of fields which have run longer in the cycle may not be economic. On yield returns alone there was no apparent difference between protection with fungicidal dusts or spray.

Efficacy of protection. A number of observation points were marked in each area and observations made at those points at each plucking until protection ceased at the end of February. The following key was used to assess the blister incidence:—

0—no infection.

1—slight infection on leaves observed without undue searching.

2—fairly heavy leaf infection.

3—very heavy leaf infection.

4—light die-back following stem infection.

5—fairly heavy die-back.

6—almost total loss of plucking shoots.

Between 12th, and 15th, February, 1951 (1½ months after the experiment commenced) assessments on both No. 7 and No. 8 fields showed an almost complete absence of infection, observations at all points being assessed at 0.

Table 3 shows the assessment of the incidence of blister blight made on January 19th, 1952 (No. 8 field) and Table 4 that made on January 22nd, 1952 (No. 7 field) during the height of the blister attacks.

Table. 3. *Field No.* 8. *Blister incidence at observation points on* 19-1-52.

Observation post No.	"Whirlwind" dusted area		Hand-dusted area		Sprayed area		Unprotected area	
	Incidence	Avg:	Incidence	Avg:	Incidence	Avg:	Incidence	Avg:
1	1 - 2	1.5	1	1.0	0 - 1	0.5	3 - 4	3.5
2	1 - 2	1.5	1	1.0	0 - 1	0.5	4 - 5	4.5
3	1 - 0	0.5	1 - 2	1.5	0 - 1	0.5	3 - 4	3.5
4	1 - 2	1.5	1 - 2	1.5	0	0	2 - 3	2.5
5	1 - 0	0.5	0 - 1	0.5	0 - 1	0.5	3 - 4	3.5
6	1 - 2	1.5	2- 1	1.5	0	0	3 - 4	3.5
7	2 - 1	1.5	1	1.0				
8	1 - 2	1.5	1	1.0				
9	1	1.0	1 - 2	1.5				
10	2 - 3	2.5	2 - 1	1.5				
11	1 - 2	1.5	1	1.0				
12	2 - 3	2.5	1 - 1	0.5				
13	3 - 4	3.5						
14	1 - 0	0.5						
Average		1.5		1.0		0.3		3.5

Table 4. *Field No.* 7. *Blister incidence at observation points on* 22-1-52.

Observation Post No.	"Whirlwind" dusted area		Hand-dusted area		Sprayed area		Unprotected area	
	Incidence	Avg:	Incidence	Avg:	Incidence	Avg:	Incidence	Avg:
1	2 - 1	1.5	1 - 2	1.5	0 - 1	0.5	3 - 2	2.5
2	1 - 2	1.5	1	1.0	0 - 1	0.5	3 - 2	2.5
3	1 - 2	1.5	2 - 1	1.5	0 - 1	0.5	3 - 4	3.5
4	1 - 2	1.5	1	1.0	0 - 1	0.5	3 - 4	3.5
5	1 - 2	1.5	1	1.0	0 - 1	0.5	3 - 4	3.5
6	2 - 1	1.5	1 - 0	0.5	1 - 0	0.5	3 - 2	2.5
7	1	1.0	2 - 1	1.5			2 - 3	2.5
8	1 - 2	1.5	1 - 2	1.5			2 - 3	2.5
9	1 - 2	1.5	1	0.5			2	2
10	1	1.0	1 - 2	1.5				
11	2	2.0	1 - 2	1.5				
12	2	2.0	2 - 1	1.5				
13	1 - 2	1.5	1	1.0				
14	3 - 4	3.5	1 - 2	1.5				
15	1 - 2	1.5	2 - 1	1.5				
16	2 - 1	1.5	1 - 2	1.5				
17	2 - 3	2.5	1 - 2	1.5				
18	2 - 1	1.5	1 - 2	1.5				
Average		1.7		1.3		0.5		2.8

From tables 3 and 4 it is obvious that the most efficient form of protection was by spraying. With hand dusting there was not any observable die-back of plucking shoots but on the "Whirlwind" dusted area points which were difficult or impossible to cover adequately from roads or footpaths (Table 3 No. 13, and Table 4 No. 14) showed die-back caused by stem blisters. The unprotected area, however, showed die-back and heavy incidence of blister at nearly all observation points. Though there was no doubt that the best method of control was by spraying, dust protection under the conditions of this experiment was sufficiently adequate to avoid die-back of plucking shoots. A typical crop return (Table 5) for pluckings on 19/1/52 and 11/1/52 show the depression of crop between the unprotected areas

and those areas receiving fungicidal protection. On those occasions the unprotected areas were hardly worth plucking and gave only 1/5th to 1/7th of crop obtained from the protected areas.

Table 5. *Crop returns on* 19-1-52 (*No.* 8 *Field*) *and* 11-1-52 (*No.* 7 *Field*) *at a plucking during the blister season. Crop expressed as pounds made tea per acre*

	No. 8 Field	No. 7 Field
"Whirlwind" dusted area	16	11
Hand-dusted area	14	13
Sprayed area	15	15
Unprotected area	3	2

Cost of Protection. The "running" cost has been worked out for the period December 1951—February 1952 and averaged as costs for each 10 day plucking round (Table 6). In the case of spraying, applications were made once each plucking round on the day after plucking and with dusting twice at 5 day intervals. There was a total of 16 pluckings during the protection period. Costs are worked out at 44 cents per pound of "Cuprosana" 4 per cent copper dust, and 11 cents per pound of "Perenox" which were prices prevailing during the time of the experiment. Labour costs for application are included but supervision, beyond that of the supervising kangany is not shown, as it could not be accurately assessed. Dusting received as much specialised supervision as spraying. Costs of machines or depreciation of equipment are not assessed.

Table 6. *Running costs on Fields* 8 *&* 7 *per plucking round of* 10 *days.*

	"Whirlwind" dusted area		Hand-dusted area		Sprayed area	
	Field 8	Field 7	Field 8	Field 7	Field 8	Field 7
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Total protection costs	4/56	4/54	5/19	5/15	2/74	2/97
Cost of labour for protection	-/16	-/14	-/28	-/35	2/03	2/33
Cost of fungicide	4/40	4/40	4/90	4/80	-/71	-/64
Cost of fungicide expressed as % of total cost	96%	97%	94%	93%	26%	22%

Taking the average over both fields, the "running" cost of protection per acre per plucking round was as follows:—

"Whirlwind" dusting	Rs. 4/55 per acre	Exclusive of all depreciation of equipment.
Hand-dusting	Rs. 5/17 „ „	
Spraying	Rs. 2/86 „ „	

Retention of Copper. The retention of copper was in all cases higher where the fungicide was applied as a wet spray. The amount of copper in teas made from the protected areas were well below the permitted amounts.

Summary

Yield records did not reveal any difference between the relative efficiency of dust and spray protection. Blister incidence measurements, however, showed clearly that spray protection gave better control than dust. The protection of the first year field was economic and necessary but it appears possible that on a second year field, although adequate protection of crop was secured during the blister season, recovery and cropping potential of the bushes were not adversely affected during the post-blister period. The "running" cost of dusting was more expensive than that of spraying.

Acknowledgments

We gratefully acknowledge the generosity of the Directors of the Mahavilla Estates Company, Limited, and their Agents, Messrs. George Steuart & Company for permission to conduct the experiment on the Mahapahagalla Division of Ury Estate, Passara. Our special thanks are also due to Mr. B. C. V. Weeks, the Manager of Ury Estate, and his assistant, Mr. C. L. Fernando, for their willing co-operation and help during the experiment. Mr. C. L. Fernando gave invaluable help in the organisation of labour and supervision. Mr. E. S. Rajiah of the Physiology Department, was in charge of the experiment from November 1951 until the end of February 1952 and I wish to express my appreciation of his efficient work. I also wish to thank Mr. Austin and the Staff of the Passara Sub-Station for their co-operation.

REFERENCES

1. Loos, C. A. Studies in Blister Blight XI. Dusting against blister blight on Alupolla Estate, Ratnapura. *Tea Quarterly*, Vol. XXIII (III) 1952, pp. 76-80.

2. Haworth, F. Distribution of copper containing dusts. *Tea Quarterly*, Vol. XXII (III) pp. 118-120.