STUDIES IN BLISTER BLIGHT CONTROL

XI. DUSTING AGAINST BLISTER BLIGHT ON ALUPOLLA GROUP, RATNAPURA

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Up to the end of 1950 field experiments on the control of blister blight had been confined to up-country areas. It had been assumed that below 1,000 feet elevation the disease would not be of economic importance, and that for mid-country zones at elevations from 1,000 feet to 3,000 feet a few years observation on the course of the disease would be required before any prediction as to the necessity for control could be made.

In May, 1951, Mr. A. Passingham approached this Institute on the problem of blister blight control in low and mid-country areas. Mr. Passingham was of the opinion that the disease had already become a menace in these areas, and he felt that the findings of up-country experiments could not be applied to low-country conditions in all respects. Particularly was he concerned with the frequency of dusting, having regard to the more rapid rate of growth of young leaf at lower elevations.

We were in full agreement with Mr. Passingham's view and were, therefore, very grateful to be able to avail ourselves of the opportunity to conduct field experiments in the Ratnapura area. Through the generosity of Messrs. James Finlay & Co., Ltd., and Mr. Passingham, suitable facilities, labour, fungicides, etc., were made available, and are herewith gratefully acknowledged.

Considering the possibility of both water and labour shortages under low-country conditions, it was decided that the type of control to be attempted should be protection with copper based fungicidal dusts. Accordingly an experiment was designed and laid down on Alupolla Group to test out the efficiency of " Cuprosana " dusts, containing 2, 4 and 6 per cent, of copper, at varying application rates and time intervals. The dusts were applied by :—

(*a*) The " Armada " portable hand duster.

(*b*) The " Whirlwind " power duster supplemented with " Armada " on areas out of range of the power machine.

In addition to the dust applications a field recovering from pruning was sprayed with a wettable copper fungicide, at the recommended concentration of 4 ounces in 10 gallons water, at weekly intervals. The sprayed area was for comparison with areas dusted with a 6 per cent. " Cuprosana " fungicidal dust.

The experiment was commenced in July 1951 and concluded at the end of December of that year. Final observations of control, on which this report is based, were made on January 13th, 1952.

In normal years, the severest blister blight attacks are experienced during the months of the south-west monsoonal rains. A second, but less severe, attack occurs during the latter part of the north east monsoon. In 1951, during the course of the experiment, due to the partial failure of the south-west monsoon severe blister blight attacks did not occur during that season. A fairly severe attack developed, however, in December at the tail end of the north east monsoon.

Table I shows the age of the tea fields from pruning, the type of appliance used, the acreages dusted and left unprotected for control comparisons, and the application rates per acre and the time intervals of applications.

Table 1. *Areas under experimentation and details of treatments.*

Plot No.	Appliance	Date pruned	Acreage		Copper percentage, application rates, and time intervals of application.
			Dusted	Unprotected	
1	Armada	Jan. '51	11	1	2% – 4 lbs. every 4 days
2	Whirlwind & Armada	Aug. '49	26	1	2% – 7 lbs. every 7 days
3	Whirlwind & Armada	Jan. '50	12	1	2% – 6 lbs. every 7 days
4	Armada	Dec. '50	1	1	4% – 5 lbs. every 5 days
5	Whirlwind & Armada	Feb. '51	3	24	4% – 4 lbs. every 7 days
6	Whirlwind & Armada	Jul. '51	32	0	* 6% – 5 lbs. every 4 days (14 applications) 4% – 6 lbs. every 7 days (17 applications)
7	Whirlwind & Armada	Aug./Sep. 1951	12	0	* 6% – 5 lbs. every 7 days (7 applications) 4% – 6 lbs. every 7 days
8	Knapsack sprayer	Jul. '51	6	0	4 oz. wettable copper fungicide in 10 gallons water–15 gallons every 7 days.

*6% dust used for a period immediately following pruning followed by 4% dust when recovery was advanced.

Table 2 shows the summary of control results achieved and the costs of control per acre, which have been worked out on the basis of a 28 day month. In the application costs are included the costs of transport, at 79 cents per mile, of labourers and materials. Costs of applications have, therefore, varied from time to time, depending on the number of acres dusted on any particular day and the distance of the experimental area from the estate factory.

Table 2 *Summary of control achieved, and costs of control per acre.*

Plot No.	Appliance	Fungicide	Application rate and interval	Cost for 28 day month			Control achieved
				Fungicide	Transport plus labour	Total cost	
1	Armada	2% dust	4 lb. every 4 days	9/60	4/71	16/31	Insufficient
2	Whirlwind & Armada	2% dust	7 lb. every 7 days	9/60	3/68	13/28	Very poor
3	Whirlwind & Armada	2% dust	6 lb. every 7 days	8/25	4/17	12/40	Very poor
4	Armada	4% dust	5 lb. every 5 days	12/16	9/34	21/50	Very Good
5	Whirlwind & Armada	4% dust	4 lb. every 7 days	5/94	3/70	10/64	Good
6	Whirlwind & Armada	6% dust	5 lb. every 4 days	17/78	0/49	18/27	Very good to excellent
		4% dust	6 lb. every 7 days	10/42	1/70	12/12	
7	Whirlwind & Armada	6% dust	5 lb. every 7 days	10/16	?	10/16	Very good
		4% dust	6 lb. every 7 days	10/42	?	10/42	
8	Knapsack sprayer	wettable copper fungicide	15 gallons every 7 days	2/88	7/24	10/12	Excellent

*6% dust used for a period immediately following pruning followed by 4% dust when recovery was advanced.

It should be noted that the above costs of dusts are calculated on average prices of deliveries on the estate during 1951. The prices prevailing then and now (Feb. 1952) are as follows :—

	1951 deliveries on estate (average) per lb.	Prices (Feb. 1952 f.o.r. Colombo) per lb.
2% Cuprosana	34.03 cts.	37.05 cts.
4% „	43.43 „	45.98 „
6% „	50.81 „	54.02 „

General Summary of Results

2 per cent. "Cuprosana"—This precentage of copper in the dust, at the application rates and time intervals chosen, proved unsatisfactory for the control of blister blight. The application rate of 4 lbs. every 7 days gave light control in comparison with the area left unprotected. The numbers of blisters on leaves varied over a fairly wide range of intensity whilst die-back of plucking shoots was general and fairly severe. About 10 per cent. of the bushes showed severe attacks. The undusted area showed almost complete loss of crop following die-back.

4 per cent. "Cuprosana"—Applications of 5 lbs. per acre every 5 days gave very good results. The application rate of 4 lbs. per acre every 7 days, though good, was not as effective as 5 lbs. every 5 days. It may well be that the lesser degree of control obtained with 4 lbs. at 7 day intervals may not be adequate under normal monsoonal weather.

6 per cent. "Cuprosana"—5 lbs. every 5 days, on tea recovering from pruning, until recovery was well established and then 6 lbs. of 4 per cent. "Cuprosana" every 7 days have excellent results. The degree of control was as good as that given by spraying on 7 days rounds.

Copper Analyses

Dr. Haworth made copper analyses of the leaf secured from each experimental plot at each plucking. Although the method of field sampling is open to some considerable error, the estimations as a whole may be considered to have given fairly satisfactory results. Table 3 shows the copper contents found over the period of the experiment. As will be seen from the table, copper residues, except on a few occasions, can be considered satisfactory. It should, however, be borne in mind that weather conditions largely determine the copper residues at plucking. Dusting a day before plucking, in fine weather, may give residues for higher than the tolerance limit. Taking for example the copper analyses of pluck No. 4 of Plot 4, it will be seen that 103 p.p.m. of copper was recorded. That experimental plot was dusted with 5 lbs. of 4 per cent. copper dust three days before plucking. A shorter interval between dusting and plucking might well have resulted in a considerably higher copper figure.

Table 3. *Alupolla dusting experiment — Copper analyses of flush at each plucking. Total copper expressed as parts per million of dried leaf.*

Pluck No.	Plot numbers					
	1	2	3	4	5	6
1	18	17	18	19	19	16
2	21	16	21	24	18	
3	46	29	34	50	24	
4	49	22	45	103	27	
5	34	29	23	47	24	
6	24	36	67	32	25	
7	52	21	71	34	71	
8	31	20	28	25	36	
9	26	34	26	71	25	
10	47	25	25	43	32	
11	34	22	20	32	23	
12	36	25	25	31	24	
13	26	24	27	45	26	
14	45	25	47	26	22	23
15	26	24	34	25	41	50
16	50	20	24	68	88	43
17	22	16	20	17	15	19
18	21	16	20	24	22	21
19	32	22	32	40	28	25
20	59	50	31	37	38	55
21	50	33	26	53	25	35
22	45	27	29	59	43	28
23	77	28	28	43	39	91
24	34	31	28	45	30	31

Key to Plot numbers

Plot 1 Hand dusted. 4 lbs. of 2% dust every 4 days

Plot 2 " Whirlwind " and " Armada " dusted— 7 lbs. of 2% dust every 7 days

Plot 3 " Whirlwind " and " Armada " dusted— 6 lbs. of 2% dust every 7 days

Plot 4 Hand dusted—5 lbs. of 4% dust every 5 days

Plot 5 " Whirlwind " and " Armada " dusted— 4 lbs. of 4% dust every 7 days

Plot 6 " Whirlwind " and " Armada " dusted— 5 lbs. of 6% dust every 4 days from 6th July to 29th August and 6 lbs. of 4% dust every 7 days up to 27th December.

Acknowledgments

We wish to record our thanks to Mr. T. Whyte who initiated the experiment and Mr. R. V. Hinton who took over when Mr. Whyte proceeded on leave. Their help and co-operation are gratefully acknowledged.

Addendum

Mr. Hinton has kindly given his observations with regard to dusting. These observations which are substantially the same as our own are set out below.

" 1. Dusting by either " Whirlwind " or " Armada " requires the very strictest supervision, and training on the part of the person in charge. He should at all times be at the extreme carry of the dust and untreated areas

should be noted for supplementary treatment with hand machines. An intelligent labourer should be at the opening and closing handle of the "Whirlwind" to operate the dust as signalled by the person in charge. Dust should be blown in puffs rather than a continuous stream.

2. I prefer line abreast for operating "Armada" dust guns, distance between operators being determined by the strength of wind, etc.

3. On no account should dusting take place after air currents have started to move upwards, *i.e.*, about 8-30 a.m. In the low-country, dusting should recommence about 5 p.m. This is most important and leads to a complete waste of dust if not watched.

4. Use has been made of the "Armada" dust gun, which has been found to be most efficient, but requires careful handling. The cog drive is inclined to wear rapidly, spares for which are very difficult to obtain.

5. It has been proved on this estate that protection can be obtained by dusting immediately after pruning.

Finally, dusting can be effective, provided bad supervision is detected."

Appendix *

Following a preliminary report on the above experiment, Messrs. Harrisons & Crossfield, Ltd., have requested that some further comment be made on the costs of dusting compared with those of spraying over large areas, as distinct from an experimental acreage. Accordingly we publish below crop protection costs, on a basis of cost per pound of made tea using various methods of protection. Protection of 1,000 acres and a crop of 600 lbs. per acre are assumed. It will be noted that statement (g) assumes the recruitment of 190 extra labourers including wives, children, etc., a fact which is not considered in our costings as we do not agree that the recruitment of such extra labour, purely for crop protection work, is of general occurrence.

	Cost per lb. of made tea (Cents)
(*a*) "Whirlwind" dusting, using 4% Cuprosana dust at 4 lbs. per acre, every five days	13.8
(*b*) "Whirlwind" dusting, using 4% Cuprosana dust at 7 lbs. per acre, every ten days	12.7
(*c*) "Whirlwind" dusting, using 6% Cuprosana dust at 5¼ lbs. per acre, every ten days	10.0
(*d*) Hand dusting, using 4% Cuprosana dust at 4 lbs. per acre, every five days	13.0
(*e*) Hand dusting, using 4% Cuprosana dust at 8 lbs. per acre, every ten days	12.2
(*f*) Hand dusting, using 6% Cuprosana dust at 5¼ lbs. per acre, every ten days	9.5
(*g*) Knapsack spraying, using Cuprokylt at 6 ozs. per acre every ten days, using specially recruited labour	25.7
(*h*) As (*g*), with no extra labour cost involved	10.1

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