A FORECASTING SYSTEM FOR BLISTER-BLIGHT CONTROL, BASED ON SUNSHINE RECORDS

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Blister-blight control has developed into an accepted routine practice on all estates that suffer from this disease but its costs weigh fairly heavily on the economy of the estate.

If the average cost of one spraying round is taken as Rs. 2/- per acre and a 1,000-acre estate is sprayed twenty times a year, then the estate spends Rs. 40,000/- annually, on blister-blight control alone. A reduction of the number of spraying rounds by only four would mean an annual saving of Rs. 8,000/-. Some actual figures have been provided by seven estates in the Dimbula district.

TABLE 1.—*Costs of blister-blight control in* 1959 *on seven estates in the Dimbula District*

Estate No.	Acreage	Number of rounds	Costs per acre per round Rs.	Costs per lb. cents	Total costs Rs.	Costs per round Rs.
1	260	23	2.33	5.1	14,312	620
2	325	16	2.16	4.2	11,000	687
3	791	22	2.08	5.4	37,000	1,680
4	835	18	1.63	3.3	25,000	1,380
5	650	22	1.72	4.2	24,936	1,133
6	772	22	1.82	4.6	32,280	1,460
7	641	18	2.45	4.5	27,062	1,440

It is clear that a forecasting system for deciding whether it is really necessary to spray or not, might be of considerable economic importance. Previous reports on a forecasting system according to sunshine have been given by Mulder (1959) and Visser, Shanmuganathan and Mulder (1959).

Work by Visser, Shanmuganathan and Sabanayagam as yet unpublished, indicates that sunshine effectively controls Blister Blight by killing the spores; an average of 4 hours sunshine per day over a period of four or five days makes spraying on the day following that period superfluous. Thus a total of 20 hours sunshine for a 5-day period or 16 hours for a 4-day period is required if the spraying round is to be postponed. Where plucking rounds are 9 or 10 days, as in many up-country estates, a 5-day period is convenient. For mid- and low-country estates, where plucking rounds are often 7–8 days, a 4-day period should be considered.

The only additional equipment necessary is a sunshine recorder, preferably for each division, and preferably of the Campbell-Stokes type. The cost, with sufficient charts for one year, ranges from Rs. 375/- to Rs. 730/-. Generally the cost of even the more expensive instrument is saved by the omission of only a single spraying round. Estates of 600 acres could afford to buy two recorders for two divisions.

The principle of this method was put into practice in 1959 on five estates on a limited field scale. The trials were carried out by the estates on the advice of the T.R.I.

Plan of the Experiment

The principle of each experiment was that an area of 25–50 acres was divided into four or five blocks of similar size. Each of these blocks was treated separately, according to the sunshine recorded. In other words, the decision whether to spray or not to spray a block on a particular day would be taken after finding the amount of sunshine recorded during the previous four or five days.

The five blocks would normally be sprayed on 5 consecutive days, so that the spraying of the whole experimental area would be completed in five days. If a spraying round was omitted on one block, it would be necessary to reconsider spraying that block after a further five days and not after ten days, as is usually done in connexion with plucking rounds. If the sunshine had again been sufficient, the spraying would again be delayed for a further five days. The system does not therefore involve omitting a whole round at a time, but delaying for five days (half a cycle) and then repeatedly deciding, after each five days, whether the amount of sunshine justifies a further 5-day delay. There is naturally a risk of doubling the amount of spraying to be done on certain days.

One estate omitted sprays for a whole division on account of five-day records taken during the second half of the plucking round. Although this involved a considerably greater risk, the results on this estate were still quite good. We can therefore assume that the limit of 20 hours sunshine per five days or 16 hours sunshine per 4 days, is still on the high side. This particular estate saved fewer rounds than the others partly due to the practice of omitting and not delaying rounds, and partly because it was located in an area where there was much mist, and therefore little sunshine.

Method of Assessment

The assessments of Blister Blight were done by the estates according to the method described below.

Each of the five blocks of a trial was assessed at 8–10 day intervals just before plucking, according to the plucking scheme for the five blocks. The assessor picked the points of assessment in the block at random by throwing a stick of about a yard in length at ten points. Around each point where the stick fell, 5 bushes were plucked, including the third leaf on the shoot. The total flush from 50 bushes per block was properly mixed and a sample containing approximately 200 shoots was taken from the heap. Whether a shoot was counted as infected or not was decided by the infection of the third leaf only. The third leaf of every shoot in the sample was then examined for signs of infection, varying from a translucent spot to mature spore-producing blisters. In order to detect the translucent spot, every leaf was examined against the light. Only the number of infected shoots was counted, not the number of blisters per shoot. After counting the number of infected and healthy shoots, the percentage infection was calculated.

Results

The results are given in Tables 2 to 6 and comments are added below.

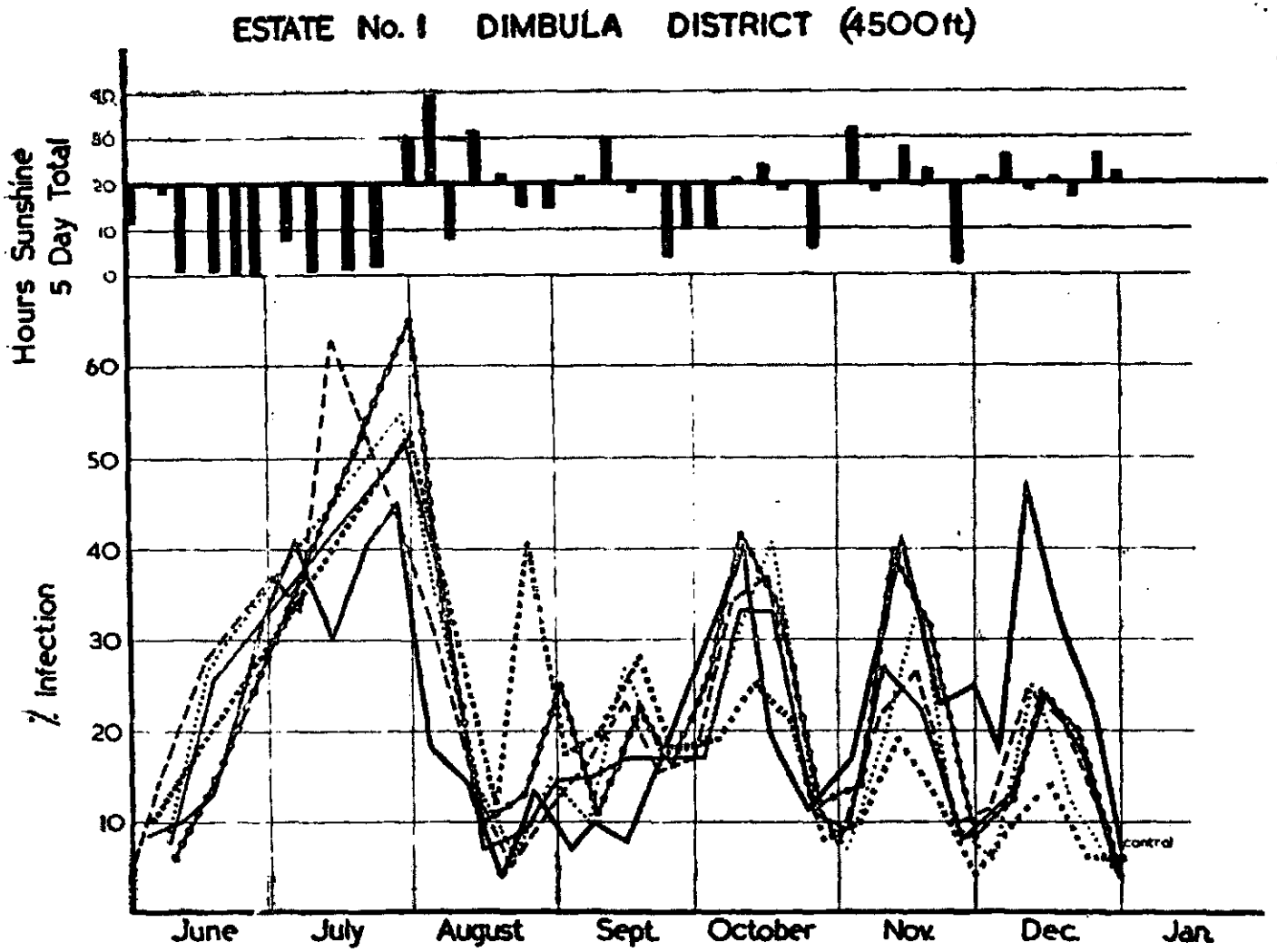

Fig. 1.—Percentage blister-blight infection from June to December, 1959, with the total sunshine for each 5-day period just before spraying was due. The various lines represent different blocks, the thick line representing the normally sprayed control.

Estate No. 1 in the Dimbula district (4,500 ft.)

In this trial the highest average monthly infection was 45% in July; this dropped to 25% in December.

The number of spraying rounds on the estate was 26, whereas the trial blocks were sprayed only 15–18 times.

The differences in infection between the different blocks cannot be regarded as significant. They are due to normal variations in severity of blister-blight infection at various spots in a field. Unfortunately, some blocks were not assessed during July.

TABLE 2.—*Estate No. 1. Dimbula District (4,500 ft.). Average percentage shoot infection and number of spraying rounds per month. Blister-blight forecasting system based on sunshine records for Blocks A—E, normal estate spraying for Block F (control)*

	Month	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Block	Average daily sunshine for each month	1 hr. 31min.	2 hr. 24min.	5 hr. 12min.	3 hr. 33min.	4 hr. 45min.	4 hr. 39min.	3 hr. 49min.	Total No. of rounds
A	% Infection	20.9	45.7	15.4	18.0	23.3	19.4	16.5	18
	No. of spraying rounds	3	4	3	3	2	2	1	
B	% Infection	18.1	—	17.0	18.2	25.3	17.6	11.9	16
	No. of spraying rounds	3	3	2	3	2	2	1	
C	% Infection	16.4	—	16.2	16.9	23.9	17.1	14.9	15
	No. of spraying rounds	3	3	2	2	2	2	2	
D	% Infection	13.2	—	18.5	18.1	27.9	23.2	16.2	15
	No. of spraying rounds	3	3	2	3	1	2	1	
E	% Infection	17.0	—	31.5	20.5	18.4	11.5	8.9	16
	No. of spraying rounds	3	3	2	3	2	2	1	
F	% Infection	10.6	37.9	12.3	11.4	22.6	26.9	25.3	26
	No. of spraying rounds	3	4	4	3	4	4	4	

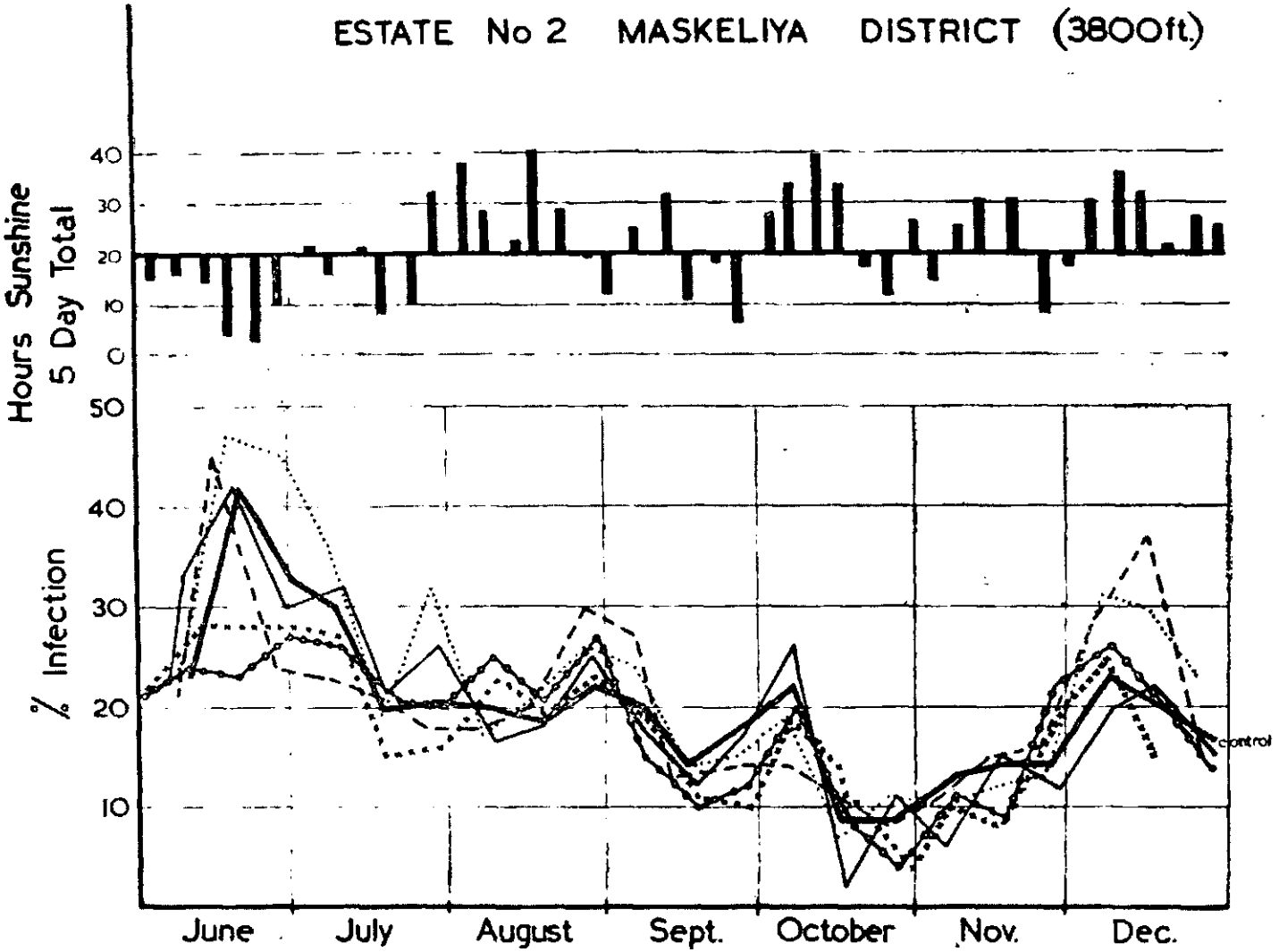

Fig. 2.—Percentage blister-blight infection from June to December, 1959, with the total sunshine for each 5-day period just before spraying was due. The various lines represent different blocks, the thick line representing the normally sprayed control.

Estate No. 2 in the Maskeliya District (3,800 ft.)

The number of spraying rounds was successfully reduced from 23 to 11–13 in the experimental blocks, without an appreciable increase in Blister Blight. On the whole, the infection was less severe than in the Dimbula District, the highest infection being 38% for Block B in June.

TABLE 3.—*Estate No. 2. Maskeliya District (3,800 ft.). Average percentage shoot infection and number of spraying rounds per month. Blister-blight forecasting system based on sunshine records for Blocks A—E, normal estate spraying for Block F (control)*

	Month	June	July	Aug	Sept.	Oct.	Nov.	Dec.	
Block	Average daily sunshine for each month	2 hr. 24min.	3 hr. 38min.	5 hr. 42min.	3 hr. 50min.	5 hr. 24min.	4 hr. 32min.	5 hr. 25min.	Total No. of rounds
A	% Infection	20	21	22	18	11	14	26	12
	No. of spraying rounds	4	2	1	2	1	2	0	
B	% Infection	38	29	21	17	12	11	28	11
	No. of spraying rounds	3	2	0	3	1	2	0	
C	% Infection	35	26	20	15	13	11	19	12
	No. of spraying rounds	3	3	1	2	1	2	0	
D	% Infection	24	22	24	9	11	14	21	13
	No. of spraying rounds	3	2	2	3	1	1	1	
E	% Infection	26	21	22	13	11	13	20	13
	No. of spraying rounds	3	2	2	3	1	2	0	
F	% Infection	34	23	20	17	13	13	20	23
	No. of spraying rounds	4	3	4	3	3	3	3	

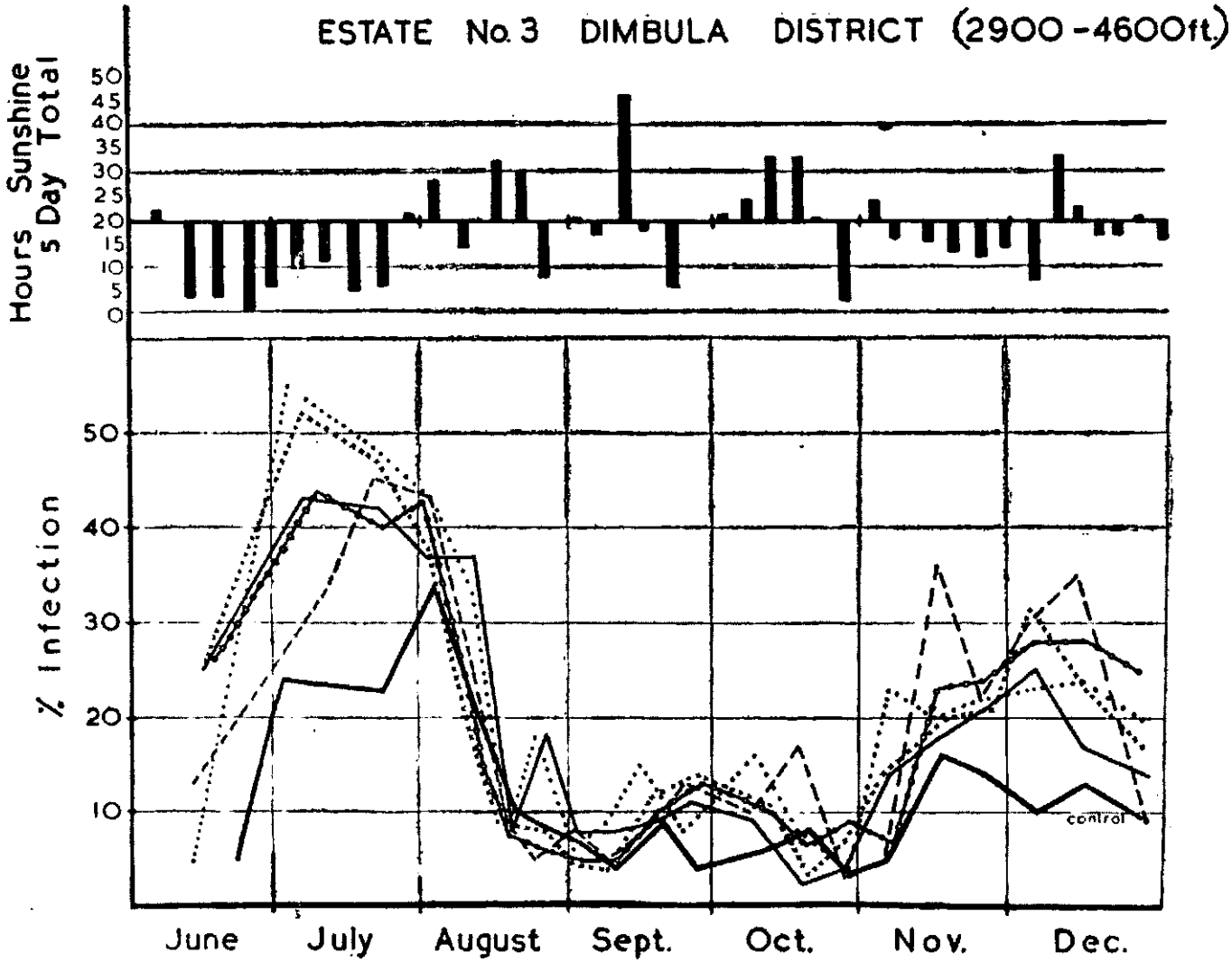

Fig. 3.—Percentage blister-blight infection from July to December, 1959, with the total sunshine for each 5-day period just before spraying was due. The various lines represent different blocks, the thick line representing the normally sprayed control.

Estate No. 3 in the Dimbula District (2,900—4,600 ft.)

On this estate the reduction in number of spraying rounds have given good results during August, September, October and November but during July and December the blister-blight infection went up in the experimental plots. The reason for this is that the plots sprayed according to sunshine had ten-day rounds, while the control block was sprayed every seven days.

TABLE 1.—*Estate No. 3. Dimbula District (2,900 ft.—4,600 ft.). Average percentage shoot infection and number of spraying rounds per month. Blister-blight forecasting system based on sunshine records for Blocks A—E, normal estate spraying for Block F (control)*

	Month	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Block	Average daily sunshine for each month	1 hr. 46min.	5 hr. 17min.	3 hr. 54min.	4 hr. 16min.	4 hr. 19min.	4 hr. 58min.	Total no. of rounds
A	% Infection	39.5	20.7	8.5	10.0	21.0	24.6	9
	No. of spraying rounds	2	2	3	0	1	1	
B	% Infection	51.5	25.5	9.5	9.3	4.7	23.5	11
	No. of spraying rounds	2	2	2	1	1	3	
C	% Infection	42.5	25.0	9.0	5.0	17.6	18.6	9
	No. of spraying rounds	2	2	2	1	1	1	
D	% Infection	41.8	18.5	8.2	8.7	17.6	23.3	9
	No. of spraying rounds	3	2	1	1	1	1	
E	% Infection	49.9	19.7	8.3	6.6	18.4	25.3	9
	No. of spraying rounds	2	2	2	1	1	1	
F	% Infection	23.5	17.6	6.0	6.0	11.1	10.6	16
	No. of spraying rounds	4	2	3	2	2	3	

Estate No. 4 in the Hewaheta District (3,260 ft.)

This area seems to be ideal for the saving of a considerable number of spraying rounds.

Infection remained low throughout the experiment, compared with the figures for the up-country estates.

The experimental blocks did not differ to any appreciable extent from the control block, which was sprayed with the rest of the estate.

Almost two-thirds of the spraying rounds were omitted during the five months of the experiment.

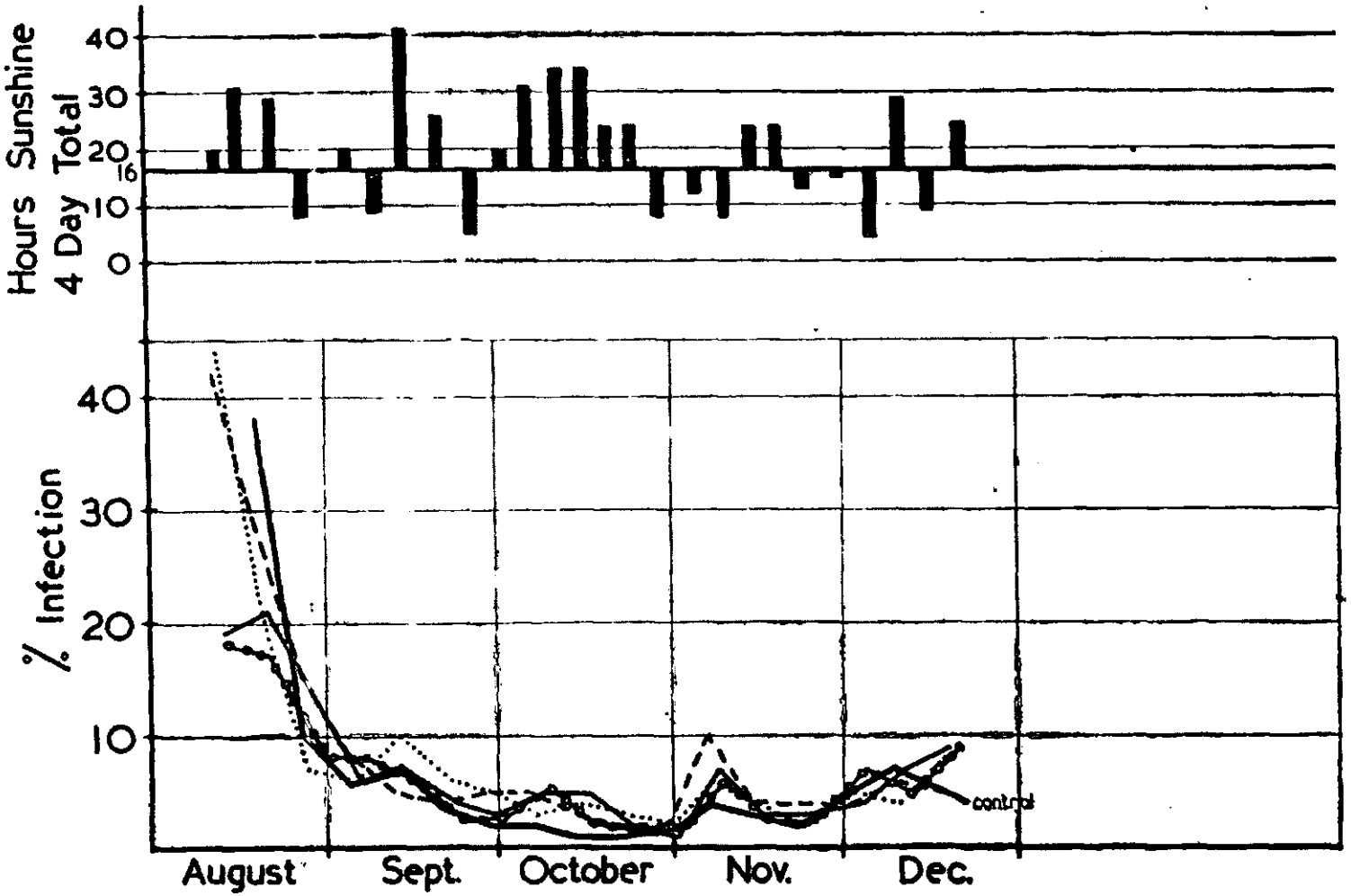

Fig. 4.—Percentage blister-blight infection from August to December, 1959, with the total sunshine for each 4-day period just before spraying was due. The various lines represent different blocks, the thick line representing the normally sprayed control.

TABLE 5.—*Estate No. 4. Hewaheta District (3,200 ft.). Average percentage shoot infection and number of spraying rounds per month. Blister-blight forecasting system based on sunshine records for Blocks A—D, normal estate spraying for Block E (control)*

Block	Month	Aug.	Sept.	Oct.	Nov.	Dec.	
	Average daily sunshine for each month	6 hr. 42min.	5 hr. 55min.	5 hr. 54min.	4 hr. 8min.	4 hr. 36min.	Total no. of rounds
A	% Infection	28.3	5.5	3.0	6.0	5.0	6
	No. of spraying rounds	0	2	1	2	1	
B	% Infection	24.0	6.7	3.0	4.0	5.6	6
	No. of spraying rounds	0	2	1	2	1	
C	% Infection	20.0	5.0	4.0	3.5	6.6	5
	No. of spraying rounds	0	1	1	2	1	
D	% Infection	14.0	5.6	3.2	4.0	7.5	6
	No. of spraying rounds	0	1	2	2	1	
E	% Infection	24.0	4.7	1.5	3.0	5.3	17
	No. of spraying rounds	3	4	3	4	3	

Estate No. 5 in Dimbula District (4,500—5,000 ft.)

Even in one of the worst blister-blight areas, the method proved to be reliable and useful even when used in a slightly modified way.

The result was very satisfactory because no increase in blister-blight infection arose from the reduction in the number of spraying rounds.

This trial differed from our lay-out of the experiment in that the decision to spray or not to spray, was taken once every five days for a whole division and not separately for fields of a division, or blocks in a field on consecutive days. Nevertheless, the highest infections recorded in the experimental area and in the control field were the same (44% in July).

TABLE 6.—*Estate No. 5. Dimbula District (5,500 ft.). Average percentage shoot infection and number of spraying rounds per month. Blister-blight forecasting system based on sunshine records for Blocks A—D, normal estate spraying for Block E (control)*

Block	Month	June	July	Aug.	Sept.	Oct.	Nov.	
	Average daily sunshine for each month	0 hr. 51min.	1 hr. 42min.	4 hr. 23min.	2 hr. 57min.	3 hr. 9min.	2 hr. 39min.	Total no. of rounds
A	% Infection	16.7	38.3	32.5	20.3	7.4	4.6	19
	No. of spraying rounds	4	4	2	3	3	3	
B	% Infection	17.3	34.6	11.5	19.6	6.1	4.0	17
	No. of spraying rounds	4	3	2	3	3	2	
C	% Infection	17.5	42.3	19.7	18.4	6.9	3.3	16
	No. of spraying rounds	4	3	2	3	2	2	
D	% Infection	11.5	41.3	17.5	17.3	6.9	5.1	18
	No. of spraying rounds	4	3	2	3	3	3	
E	% Infection	16.0	55.6	18.3	19.0	3.4	4.1	20
	No. of spraying rounds	4	4	3	3	3	3	

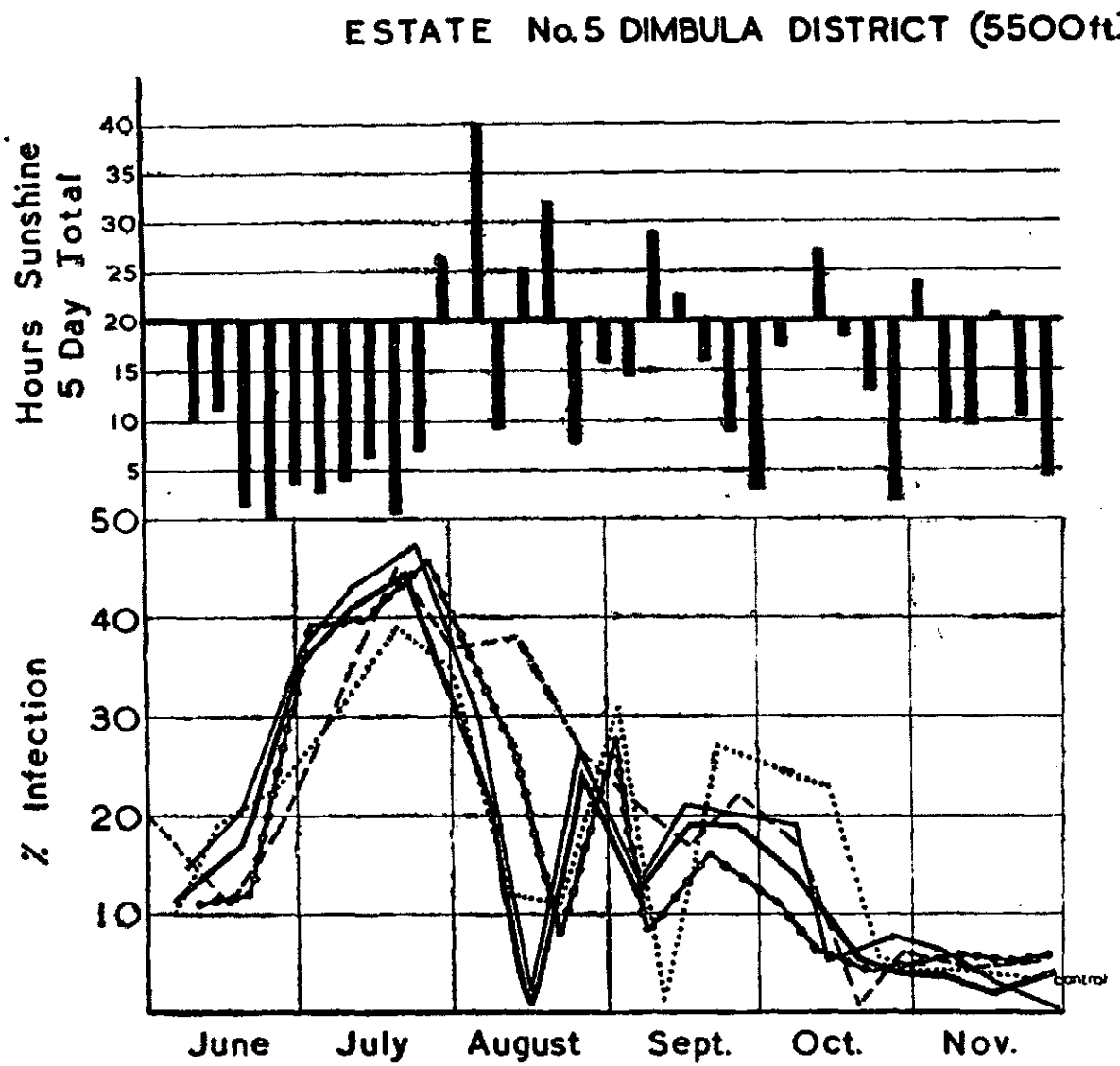

Fig. 5.—Percentage blister-blight infection from June to November, 1959, with the total sunshine for each 5-day period just before spraying was due. The various lines represent different blocks, the thick line representing the normal sprayed control.

Conclusions

The method of forecasting the necessity of blister-blight control, based on sunshine records of the foregoing five-day period, has been proved to be of considerable advantage on five estates.

TABLE 7.—*Summary of Trial Data*

Estate	Average no. of hr. sunshine for period of experiment	Average percentage infection		No. of routine rounds on estate	Average no. of rounds saved
		Expt.	Control		
No. 1	3 hr. 41 min.	17.0	21.0	26	10
No. 2	4 hr. 24 min.	19.3	20.0	23	11
No. 3	4 hr. 49 min.	20.5	12.5	16	7
No. 4	5 hr. 27 min.	8.2	7.7	17	11
No. 5	2 hr. 36 min.	17.5	19.0	20	2.5

Although there is good hope that this forecasting system will be generally applicable, any estate that wishes to save on blister-blight control, by reducing the number of rounds, should first try this method on a limited scale on a field or a division.

Acknowledgment

The co-operation of the five estates who carried out the experiments on their own account and their willingness to produce the figures for publication is gratefully acknowledged.

Thanks are also due to the estates who gave us the information on costs of blister-blight control.

References

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