THE POSSIBILITY OF TIMING BLISTER BLIGHT SPRAYING ACCORDING TO SUNSHINE RECORDS

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1. Introduction

The usefulness of a practical system of forecasting blister blight outbreaks on tea has been realised and needs no emphasis. Several investigators during the past six years have suggested methods of forecasting blister blight incidence based on the relation between weather conditions and the outbreak of blister blight.

Till recently no work of this nature has been done in Ceylon. However, the need for a suitable forecasting system had been realised and its usefulness was discussed briefly previously (1). Work was, therefore, initiated during the monsoon season of 1958 to devise a suitable system for use on tea estates in Ceylon, a full account of which will be given in papers by VISSER (2) and VISSER *et al* (3). A summary of the main results and their practical implications follows below.

2. Material and method

Two systems, one based on the total daily sunshine and another on the amount of spore germination obtained on glass slides in the field, were tried out during the course of the investigations. It was found that the first system appeared more practicable under existing conditions and, therefore, in this paper we will briefly describe this system and discuss its merits.

According to this system, spraying against blister blight is carried out on the principle that a certain amount of sunlight per day is likely to kill the majority of the spores that could cause infection at that time. Therefore, during periods with adequate sunshine the degree of infection is expected to remain within reasonable limits (30 to 35% shoot infestation), and spraying becomes necessary only during periods with insufficient sunshine.

The first stage of the practical application of this system was tested out on a field experiment at St. Coombs (4,500 ft.). The experiment had 8 treatments each replicated 6 times. The treatments were all based on certain arbitrarily laid out sunshine figures and were as follows:—

Treatment 1.— Spraying was carried out only if the average amount of sunshine per day for a 5-day period was less than 2½ hours, but at intervals of not less than 10 days. That is to say, following the first spraying, the next would be done after 10 days, if the second 5-day period (8th to 10th day) had less than an average of 2½ hours of sunshine per day, irrespective of weather conditions during the first 5-day period. In case the sunshine during the second (and/or 3rd, 4th, etc.) 5-day period was not below the critical level (had more than 2½ hours sunshine) spraying would be postponed until after the next 5-day period that was found to have had less than an average of 2½ hours sunshine per day.

Treatments 2 and 3 were similar to 1 but with the minimum sunshine required set at average of 3 and 3½ hours per day, respectively.

Treatments 4, 5 and 6 also had the minimum required sunshine set at 2½, 3 and 3½ hours, respectively, but the period was fixed at 7 days. Here spraying was carried out on the day following a 7-day period during which the total amount of sunshine recorded was below the set minimum.

Treatment 7.— Control — sprayed every 9–10 days.

Treatment 8.— Control — untreated.

All spray applications were made using hand-operated Senior Knapsack sprayers with a 50% copper fungicide at the rate of 6 oz. per 15 gallons.

The degree of infestation on the experimental plots was assessed in the usual manner by plucking at random 10 bushes from each plot of 1/20th acre and determining the percentage of shoots whose third leaves carried infection.

3. Results and Discussion

The experiment was conducted over a period of about 8 months during which time 46 assessments for blister blight infestation were made. The average monthly infestation and the number of sprays for each treatment are given in table 1.

TABLE 1.—*Average monthly shoot infestation of plots sprayed according to th amount of sunshine recorded over 5-day and 7-day periods*

Treatment	% MONTHLY SHOOT INFESTATION									Total number of sprayings
	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average	
5-day										
(1) < 12½ hrs.	14.5	42.2	45.2	16.0	24.7	28.1	20.9	20.1	26.5	11
(2) < 15 ,,	13.3	37.2	39.4	17.4	23.5	23.5	15.0	17.5	25.5	11
(3) < 18½ ,,	15.3	33.8	26.0	12.3	16.5	18.1	15.9	19.5	19.7	13
7-day										
(4) < 17½ hrs.	18.4	47.7	42.9	17.7	14.1	27.7	23.3	25.7	27.2	9
(5) < 21 ,,	17.5	46.3	39.0	14.6	12.8	21.2	21.8	33.4	25.8	11
(6) < 26½ ,,	15.9	45.3	34.8	12.7	17.7	19.5	18.6	12.6	22.1	17
(7) Control sprayed	14.0	26.0	28.5	7.7	22.1	10.7	17.1	8.3	16.8	24
(8) Control untreated	15.9	43.4	54.8	19.3	48.7	37.8	39.1	32.5	36.2	9
Sign. Diff. P=0.05	10.6	13.8	7.4	5.5	10.0	6.2	11.0	8.8	5.9	—

It will be seen from the table that treatment 7 which is similar to normal estate praying gave the best protection. However, treatments 3 and 6 which were based on an average sunshine of 3½ hours over a 5 day and 7-day period respectively gave protection not significantly different from treatment 7. The important point to note here is that in the case of treatment 3 only 13 sprayings were given and for 6, 17 sprays as compared with 24 sprays for the control (7). These figures clearly indicate that when spraying is carried out on the basis of sunshine records, a considerable saving in spraying costs could be achieved. In fact, even spraying based on an average of 2½ to 3 hours sunshine daily, whether over a 5-day or 7-day period gave reasonable protection (as seen in treatments 1, 2, 4, and 5' during

most months. This was, however, obtained with less than half the number of spraying rounds compared to the control (7). The infestation in the case of these treatments exceeded the tolerance limit of 35% during two months only. During these two months — June and July — the best protection was achieved when spraying was carried out on the basis of an average of 3¾ hours daily sunshine per 5-day period.

These figures tallied with other experimental data (2) which indicated that about 4 hours of sunshine daily are adequate to keep blister blight infestation within reasonable limits.

The fact that none of the experimental treatments is (judging from the figures) better than the routine estate spraying, should not be considered a decisive drawback, as the omission of a certain number of sprayings must inevitably lead to a slightly greater incidence of blister blight. A better result than from normal spraying could be achieved with the present fungicides only by spraying at shorter intervals during periods when the amount of sunshine is very low.

Further experiments carried out during the N.E. Monsoon on two estates in the Nuwara Eliya district at elevations of 5,000 to 6,000 ft. which are subject to severe mist, confirmed our findings on St. Coombs, that sunshine data could be used as a guide in timing spraying rounds.

5. Conclusions

It appears from the above results that a spray-timing system, based on the principle that spraying is discontinued following a 5-day period during which sunshine exceeds 3¾ hours daily and resumed when sunshine drops below this level, can achieve a protection not much less effective than routine spraying while markedly reducing the number of spraying rounds.

The use of a 7-day period for the determination of sunshine appeared feasible but was found somewhat less efficient as regards protection and spraying costs. The use of a period longer than 7 days would seem to be inadvisable as the chances are that many days within that period may be favourable for infection though the average sunshine for the whole period may not be below the required minimum.

It can be concluded, therefore, that a spray-timing system based on sunshine data shows considerable promise for application on a field scale.

6. Application of the System on a field scale

No forecasting system is of any use unless it can be applied on a field scale. This system based on sunshine data has so far not been tested out on a field scale and it is, therefore, not our opinion that superintendents of estates should straightaway try this scheme on an estate scale. Several trials have been laid out to test the suitability of this scheme on a field scale and until further information is available, we are not in a position to recommend the method at present. However, it would be appreciated if superintendents would try out the method on an experimental scale on one or two fields on their estates so that we could be appraised of the practical difficulties involved. It is our opinion that the introduction of the spray-timing system on whole estates is likely to introduce numerous difficulties at the managerial level.

(1) In the first place it will be necessary to decide on a regular plucking round. This would be required to determine a period between plucking rounds over which the sunshine is to be recorded. It is our view that in the case of plucking rounds varying from 8 to 10 days it will be necessary to have two periods. The condition that two sunshine periods cover the interval between two plucking rounds is essential

in order to ensure that spraying, if required, will always be done either midway between two pluckings or on the day following plucking. Otherwise, it may happen that plucking has to be done soon after spraying thereby resulting in the copper content of the made tea exceeding the tolerated limit.

(2) For plucking rounds of 7 days or under it will not be necessary to divide the interval into two periods and the whole interval could be treated as one period. It should, however, be borne in mind that it is better to keep the interval as low as possible or else it may be necessary to raise the minimum total sunshine so as to avoid risks.

(3) It will further be necessary to appraise the disease liability of the different fields. For instance, it may be necessary to raise or lower the minimum level of 4 hours daily sunshine or 20 hours for a 5-day period to suit local conditions. On those fields which are normally subject to heavy infection, spraying would have to start fairly early and proceed into the wet season proper. In such instances it may be advisable to adopt a higher minimum limit of say 5 hours sunshine daily, to be reduced later to 4 hours.

(4) Indications are that during the second half of the monsoon when the weather becomes more intermittent and the infestation usually abates, spraying on a basis of 3 to 4 hours sunshine daily may be possible. It is likely that the number of spraying rounds during that period could be reduced to about half while maintaining adequate protection.

(5) Further, it is strongly recommended that this scheme should not be applied to tea coming into bearing either after planting or subsequent to pruning.

(6) To start the scheme on an estate, division or field, the area selected has to be divided into 10 blocks in the case of a plucking interval of 10 days or more. Each of these blocks will have to be plucked on successive days and sprayed on the following day. Subsequently plucking should as far as possible be carried out at regular intervals, but could be shifted one day on either side of the due date. Care should, however, be taken to see that 3 to 4 days elapse between the last spraying and plucking. Spraying should be carried out as described earlier and should be done as far as possible on the due dates. It is very likely, especially in the thick of the monsoon, that 2 blocks or one-fifth of the estate may have to be sprayed on one day, and if a postponement is made 2/5 of the estate may have to be sprayed the next day.

It is very difficult to foresee the practical difficulties involved in adopting this scheme without field experience. However, the following conditions will have to be adhered to if the scheme is to be applied on an estate scale: (1) as far as possible plucking has to be done at regular intervals, and (2) spraying has to be done strictly on the due dates, as postponement may double the work for the next day. It may be necessary to spray as much as one-fifth of the whole estate on a single day which would necessitate twice the normal gang strength of spraying men and spraying equipment. When spraying is based on this scheme the work will not be distributed uniformly but will be concentrated over a few days at a time. Hence the greatest problem that would face the Superintendent would be to provide alternate work for this greatly enhanced spraying gang.

Finally it should be stated that savings on the cost of blister blight control can only be achieved by reducing the number of spraying rounds. This will mean running some risks which can be minimised by introducing special rapid methods of control.

(7) Summary

This paper deals briefly with a new method of timing blister blight spraying according to sunshine records. A spray-timing system based on an average daily

sunshine of 3–4 hours recorded over 5-day and 7-day periods provided adequate protection, while reducing the number of spraying rounds by about 40% over a period of about 8 months.

This method of spraying shows considerable promise as regards its application on estates. However, it involves some practical difficulties a few of which are briefly discussed here.

References

(1) VISSER, T., SHANMUGANATHAN, N. and SABANAYAGAM, J. V.— Blister blight control in 1957 with respect of fungicidal formulation, application rates and yield. *Tea Quart.* **29,** 1958: 9–21.

(2) VISSER, T.— Climatic condition and the incidence of blister blight (*Exobasidium vexans*) on tea. I. Spore germination as affected by sunshine and rainfall. (To be published in Bulletin, New Series No. 2. 1959).

(3) VISSER, T., SHANMUGANATHAN, N. and SABANAYAGAM, J. V.— Climatic conditions and the incidence of blister blight on tea. II. Disease control in the field on the basis of spore germination and sunshine data. (To be published in Bulletin, New Series No. 2, 1959).