

# DEVELOPMENTS IN BLISTER BLIGHT CONTROL

## I. INTRODUCTION TO THE 1955 SERIES OF BLISTER BLIGHT CONTROL EXPERIMENTS

B. N. Webster and P. O. Park\*

*Previous work on the control of the blister blight disease of tea has been published in this journal in the series entitled "Studies in Blister Blight Control, I-XVI". This series was terminated in 1954 when, in the final paper, the title used above was suggested as suitable for the publication of future results. The papers in this issue accordingly represent the start of a new series in which the results of an extensive programme of experimental work designed to answer a number of outstanding questions will be reported. This work was carried out in co-operation with the research staff of Messrs. Fisons Pest Control Ltd., whose ready assistance in this joint research programme is most welcome.*

**Methods:**—During the planning of the season's programme it was decided that, wherever possible, experiments should be designed in such a way that the results could be subjected to statistical analysis. This necessitated first of all a departure from the arbitrary method of assessment previously used (Loos, 1951a), and the institution of an assessment relying on a real numerical basis.

Two methods were chosen, both of which have been used previously in assessing blister blight attacks (Loos, 1951b). Each depends on the collection of flush from a given number of bushes selected at random in the area to be assessed, and the further random selection of a given number of shoots (usually 100) from this sample. It was decided that, for the purposes of assessment, shoots should be plucked to three leaves and a bud, the third leaf being chosen for the count of total blisters. The choice of the third leaf for blister counts is derived from the assumption that, on a short plucking cycle, many of the "second leaves" would not have been opened sufficiently long for infection to have reached a visible stage. During counting all blisters and "translucent spots" (Loos, 1951c) were counted. It was found in practice that the ability to distinguish translucent spots due to blister from those due to other causes was soon acquired. Further, it is the third leaf, which is normally left on the bush, which it is most important to protect. Results of counts were expressed as "total number of blisters on 100 third leaves" and as "percentage of infected shoots", *i.e.* the number of shoots per 100 whose third leaves carried blisters.

Random selection of bushes to be included in the assessment was made either by throwing a conspicuously painted stick, and selecting the nearest bush to its point of rest, or by the use of two tables of random numbers, one to designate the row to be chosen, counting from a fixed point, and the other to designate the number of the bush in that row. This latter method has the disadvantage of being applicable only to plots of regular shape and size, which are not always easy to fit in to the average tea field. It is a slower method and was only adopted in one of the field experiments.

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\* Member of the staff of Fisons Pest Control Ltd.

It was further decided that this numerical assessment should be applied to numerous commercial estate fields, in which the superintendent concerned considered control to be adequate, in order that a realistic figure for satisfactory control could be reached. This was done, and a figure of approximately 35 per cent infected third leaves was regarded as showing satisfactory control to have been achieved. The practical application of this technique has been explained, for the guidance of superintendents, elsewhere (Portsmouth and Webster, 1955).

It was noted in all the 1955 trials that during the first four or five weeks of the south west monsoon infection levels as high as 70 per cent or more were experienced, no matter what fungicide was used, and this observation was paralleled by the observations of many superintendents. The explanation undoubtedly lies in the fact that little or no fungicide is retained by the leaf when spraying is done during rainfall, and when the rain force exceeds a certain level. It has been suggested (Haworth, 1950) that this figure lies between  $1\frac{1}{2}$  and  $2\frac{1}{2}$  inches of rain per hour. However, despite an initially high level of infection, an efficient fungicide appears able to reduce this level after 3 rounds of spraying, or five rounds of dusting.

**Objects:**—The programme was designed to test both existing and new formulations of copper and non-copper fungicides along the following lines of investigation:—

#### SPRAYS

- (i) A statistical comparison of the relative fungicidal efficiency of copper oxide (yellow-red) and copper oxychloride (green) fungicides.
- (ii) To test new formulations of copper in the control of blister blight.
- (iii) To ascertain whether an improvement in the adhesive properties of a fungicide could result in a reduction in the rate of copper application without impaired efficiency.
- (iv) To gain confirmation on the relative efficiency of fungicides of different particle size by the use of normal commercial fungicides and colloidal copper fungicides.
- (v) To assay the fungicidal properties of two systemic antibiotic fungicides against blister blight, and of a non-copper organic fungicide.

#### DUSTS

- (i) To evaluate the relative fungicidal efficiency of a commercially available blended copper dust and a coated copper dust.
- (ii) To ascertain whether coated dusts could be satisfactorily employed on a longer round than blended dusts, thus enabling dusting to fit in better with estate plucking rounds, and effecting a reduction in cost of protection.
- (iii) To test the fungicidal efficiency of three new 4% copper blended dusts, formulated with locally produced fillers.
- (iv) To ascertain whether a coated dust could be diluted with inert filler without loss of fungicidal efficiency.

**Methods:**— 1. **LAYOUT:**—With the exception of the small scale trial carried out on St. Coombs No. 8 field (see Paper IV of this series, Park and Webster, 1956) all the field trials were on plots of  $\frac{1}{5}$  acre, or  $\frac{1}{4}$  acre, grouped in blocks, and with treatments suitably replicated. Plots were demarcated by double wires, guard rows of two bushes in width being left between the wires. Untreated plots were not included as a treatment in all of the experiments, as the purpose of the experiments was to compare the effect of the various fungicide treatments, and not to evaluate their absolute control. Further it was doubted whether untreated plots, which are completely surrounded by large areas of protected tea, would, in one season, achieve a blister blight level comparable to that of a completely unprotected tea area.

2. **EQUIPMENT:**—All spraying was performed with Birchmeier 'Senior' hand-operated knapsacks fitted with double nozzle sapphire lined jets, chosen for convenience of refilling when several different materials were in use. They gave an extremely satisfactory performance throughout the season. Spraying was done over two rows at a time.

Dusting was performed with a battery of 'Orient' hand dusters which, with the exception of points noted in the following papers, also gave a satisfactory performance with all the materials used. Dusting was done over 4 rows at a time.

3. **FIELD OPERATIONS:**—The plucking of the experiments came under the immediate control of the estate superintendent concerned, the other operations being fitted in with a plucking round arranged with the superintendent. Treatments were carried out on the day after plucking, or, when the programme necessitated it, on the day of plucking, the protection gang in the latter case following the pluckers through the field. No attempt was made to assess yield effects on the experimental plots, previous experience having shown such results to be meaningless. Assessments were made on the day before plucking, but occasionally on the same day, and on one or two occasions, when the many projects in hand made reorganisation of the programme impossible, assessment, plucking and treatment were carried out on the same day. Linen bags, numbered according to the plot, were used for the sampling of up to 100 shoots per treatment in each experiment. These were then assessed in the laboratory, and recorded on the basis described above. As a result of the rather late start made on the experiments, the first two assessments were rather high, but were regarded as invalid, as they reflected only the results of infection before treatments were begun. Analysis of results was made on seasonal mean figures.

**Weather:**—Typical monsoon conditions prevailed throughout the course of the experiments. An attempt has been made to investigate the effect of different aspects of the weather conditions on blister blight infection, findings of which will form the basis for a further paper in this series.

**Reporting:**—As a result of requests and complaints of preferential treatment from several commercial firms, it has been decided that in future experiments, products for trial by the Tea Research Institute will not be named in our publications except by special request. Further, the Tea Research Institute will not normally divulge the trade name of any product used as a standard of comparison, except to the suppliers thereof. As a result of this decision the standard fungicide to be used in future trials is likely to be varied between commercially available products shown by experiment to be of equal efficacy in blister blight control.

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