A NEW LOOK AT THE ECONOMICS OF BLISTER BLIGHT CONTROL

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Our century-old tea industry has lived with Blister Blight for more than twenty years. Today, the cost of blister blight control is not what most of you would consider as a serious component of your cost of production. There are three items of cost involved — those of machinery, labour and fungicides.

With the partial assembly of motorized mistblowers in Ceylon, the cost of machinery in terms of foreign exchange has already been somewhat reduced. Labour costs undoubtedly constitute a large component of your costs of spraying. The Institute has given you a scheme of spraying (Visser, Shanmuganathan & Mulder 1959; Mulder & de Silva 1960) which utilizes the fungicidal effect of sunshine. Using this method we can cut down the number of spraying rounds and thereby save on both labour and fungicides. It is possible that as we acquire more knowledge of the epidemiology of the causative fungus, *Exobasidium vexans* we would be able to forecast epidemics more accurately and develop more sophisticated, less expensive spraying schemes. We are at present testing an instrument devised by my colleagues Kerr & Rodrigo (1967). It is somewhat like an exposure meter used with cameras. Using this we are trying to predict accurately, future levels of blister blight infection based on two easily measurable quantities, sunshine and the current level of infection. If this device is found to be satisfactory, it will be possible to effect considerable economy by the more precise timing of your spraying rounds, and thereby save on the cost of labour. It will, however, have to be tested further, before we can release it to you.

Today I shall discuss another approach to the control of Blister Blight, which revolves around the third component of your cost, namely fungicides. Each of you may not be spending very much on fungicides, but the cumulative effect of such expenditure adds up to several million rupees in desperately-needed foreign exchange each year.

It would perhaps be helpful to refresh our memories with a few salient points about the fungus *Exobasidium vexans* Massee. It is disseminated by propagules called spores which are produced on the lower surface of a blister. These spores are liberated into the atmosphere. Each blister is capable of producing upto twenty million spores and each spore has the potential to give rise to a new blister 18 to 21 days after the fungus has penetrated the young tea leaf. During the formation of blisters, a portion of the photosynthetic area of the leaf is consumed by the fungus. In our recent experiments we have attempted to determine to what extent this reduction in photosynthetic area has reduced crop. We are, of course, aware that none of you would like to lose even the smallest fraction of your crop. We must, therefore, determine precisely the magnitude of crop loss caused by Blister Blight, and that of crop increase resulting from its control. No precise information on this aspect of the disease is still available for Ceylon tea.

Portsmouth (1951) was able to estimate that when no spraying was done, the loss of crop over a whole four year pruning cycle ranged from 20–40% a very considerable loss indeed. He also attempted to obtain different degrees of protection against Blister Blight by omitting every fourth, every third or every other spraying round. This attempt was not entirely successful for various reasons, with

which I shall not burden you. It would suffice to mention that it cannot be assumed that the tea sprayed every *other* week for example, will have double the disease incidence shown by tea sprayed *every* week ; because, the conditions necessary for the infection of young leaves by the fungus will not remain the same from one week to the next. Crop losses based on this method of obtaining levels of disease incidence have, therefore, not given reliable results.

In one of our recent experiments which ran for one year on unshaded seedling tea in the second year of its pruning cycle at St Coombs, we have overcome the problem of obtaining different degrees of protection very simply by spraying different concentrations of fungicide. We used a cuprous oxide wettable powder formulation containing 50% by weight of metallic copper at the following rates in ounces per acre — 8, 4, 2, 1, ½ and 0. Figure 1 shows the degree of protection obtained with these dosages of fungicide.

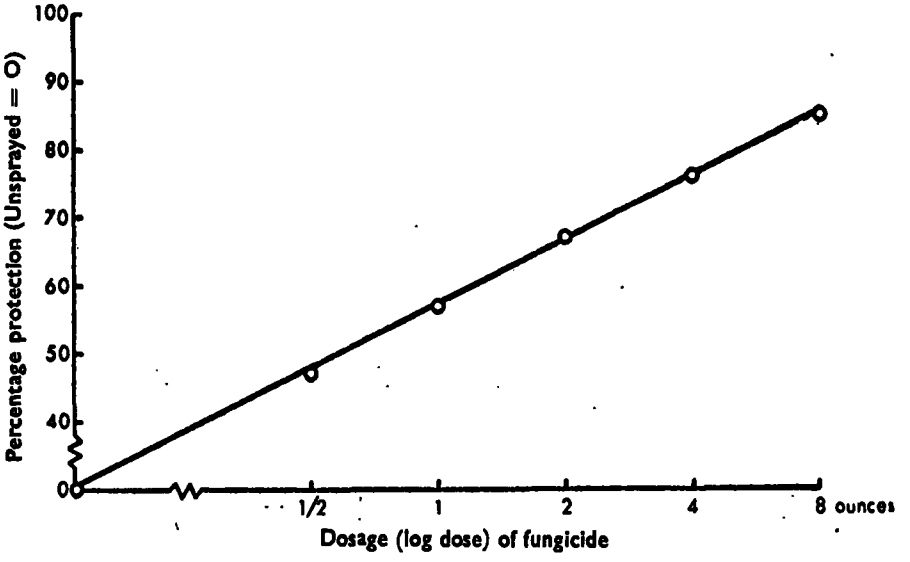

FIGURE 1 — *Protection of tea against Blister Blight with fungicide — Dosage response*

You see the linear relationship obtained when we plot percentage protection against the logarithm of the dose of fungicide within the range of concentration used in this experiment. In other words, these results tell us how much protection we obtained at each concentration of fungicide, assuming, of course, that unsprayed tea will have no fungicidal protection. For example when we sprayed eight ounces per acre we obtained about 85% protection, whereas when we sprayed half an ounce, we obtained about 47% protection. In this manner we have obtained different degrees of protection against Blister Blight.

Our next problem was to determine to what extent these degrees of protection resulted in differences in crops. Figure 2 shows the extent to which crop losses have been arrested by spraying the various doses of fungicide. Assuming that the increase in crop from unsprayed tea is nil, you will see that when the dose of fungicide is plotted on an arithmetic scale, we virtually get a linear but not significant relationship for increased crops in our range of fungicide concentration from ½ oz to 8 oz per acre, but when the dose of fungicide is less than ½ oz crop losses are appreciable. We also found no significant differences in crop at the five percent level of probability, obtained by spraying more than half an ounce of fungicide per acre, but that there was a highly significant reduction in crop where the tea was left unsprayed.

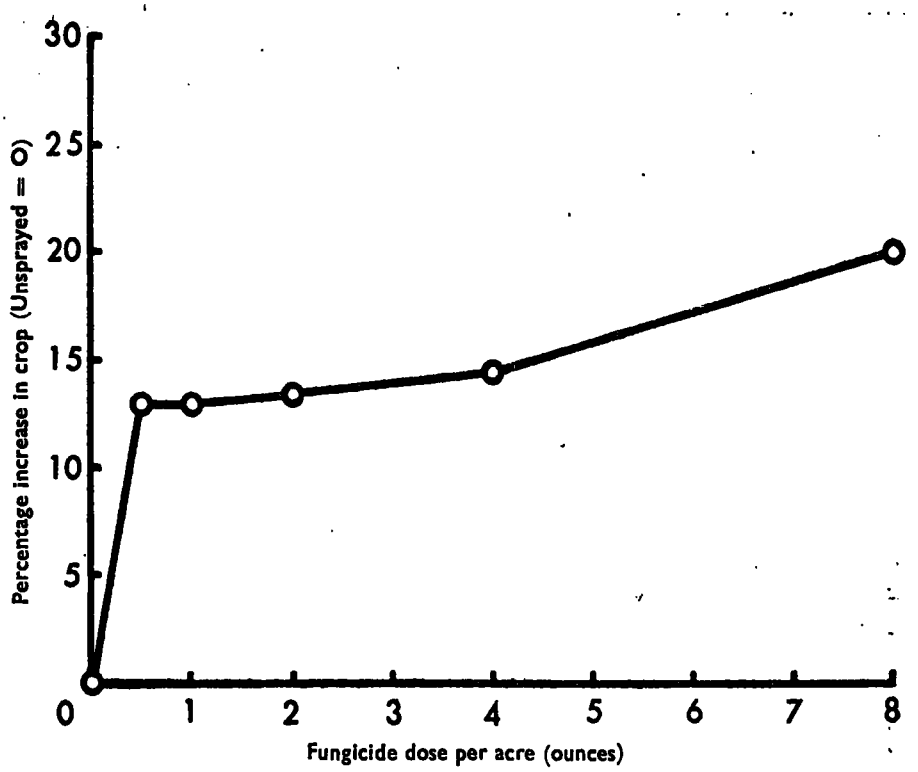

FIGURE 2 — *Percentage increase in crop with dose of fungicide used for protecting tea against Blister Blight*

What are the implications of these findings ? It appears as if beyond a *certain level* of protection crop does not seem to be affected whether you have Blister Blight or not. In other words, whereas all these years we tried to control Blister Blight thoroughly, it seems as though even if we *had* a certain amount of Blister Blight on our tea we would *not* have suffered losses in crop.

It is common in all scientific research that when we acquire a fresh morsel of knowledge several new questions which had not arisen earlier, now pose themselves, demanding to be answered. I shall spend the rest of the time at my disposal raising some of these questions and attempting to find suitable answers to them.

The first of these questions is, why does there seem to be a sharp difference between crop losses from unsprayed tea, and tea sprayed with $\frac{1}{2}$ oz of fungicide per acre ? The reason is probably because of the widespread incidence of stem Blister Blight which destroys the portion of the shoot which directly constitutes crop. Does this mean that we can spray half or one oz of fungicide per acre and still obtain the same crops as those we obtained by spraying two or four ounces? It seems as if we did just that in this experiment, which was carried out on unshaded tea in the *second* year of its cycle at St Coombs.

Would we get the same results on other estates ? We should get them provided the conditions required for blister blight infection remain the same. This, of course, is the snag. They do *not* remain the same, but vary considerably from district to district, estate to estate and even from one field to another on one and the same estate.

What would be the results with vegetatively propagated tea ? Of course it is likely that with highly tolerant clones, losses in crop will be less than with susceptible clones. We have one experiment currently running on clone TRI 2024 at St Coombs but the results are not yet available. The effects of levels of nitrogen and shade on crop losses due to Blister Blight are also being investigated. It is likely that the heavier the stand of shade, the greater will be the damage caused by the disease.

The next question that arises is, what effect would the presence of blistered leaves have on the appearance of the made tea ? In some of our experiments for the purpose of measuring blister blight infection we plucked the bud and *three* leaves instead of the normal bud and *two* leaves. On tea sprayed with half oz fungicide per acre the highest infection recorded during one year was 50% taking the third leaf into consideration. In other words, 50% of the shoots showed infection and the other 50% were healthy. When the shoot consisting of the bud and only *two* leaves is considered, this figure is halved. In other words, only 25% of the shoots were infected. Further, most of the blisters were young ones which had not yet begun to produce spores, or were hardly visible translucent spots. The fungus-infected portions of such leaves wither just as well as the uninfected areas. Although further work needs to be done on this aspect, it seems very unlikely that the made tea will be affected significantly. If you have short plucking rounds there would almost certainly be no difference at all, but with longer plucking rounds, the chances of blistered leaves being present would naturally be greater, but even then it would be most unlikely that this would make a significant difference to the appearance of your made tea, which in any case is not at its best during the monsoons.

I must make it crystal clear that the Institute does not advocate reducing the dose of fungicide currently used in your nurseries, new clearings or mature fields in the *first* year of the pruning cycle. If you get Blister Blight on such tea, it is certain that it will be affected adversely. Although our experiments were carried out on tea in the second year of the cycle, we can confidently assume that the crop losses resulting from the disease will be even less in the third, fourth, fifth and sixth years of the cycle.

You might well ask the question " Is the TRI suggesting that we look into the possibility of tolerating a certain amount of Blister Blight on our tea because we may not be losing crop ? " The answer is *yes*, but it is important to specify a *certain amount* of Blister Blight. How much is certain amount, and how much fungicide must we spray to have *this* amount of infection and no more ? There is only one way of finding that out on each estate, and that is by carrying out a survey of blister blight infection by experiments on your own estate. We shall be giving you detailed instructions on how to conduct such experiments in a future issue of *The Tea Quarterly*. I myself shall undertake to discuss the experiments with you at meetings at a district level so that any doubts or difficulties you have could be clarified.

We shall be conducting the more complicated experiments at St Coombs, and the experiments we shall ask you to do will be very simple. **I must emphasize that you should not, at this stage cut down your dose of fungicide to half or one ounce per acre over entire estate.** We still have some way to go before that can be firmly recommended.

The whole project is still very tentative and comes to you with our provisional tag, which can only be removed if you will help us by providing us with the results of the extension experiments, so that together we could achieve an annual saving of a few million rupees in foreign exchange which the country needs so desperately, and also cut down your own cost of production and thereby increase your profit per acre.

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