

THE APPLICATION OF CROP PROTECTION METHODS.

PART I. — WET SPRAYING.

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Introduction.

You have already heard from Mr. Lamb this morning, that as a result of this year's large scale experiments, the Tea Research Institute are now able to recommend the spraying of tea recovering from pruning and tea in plucking against blister blight.

Mr. Portsmouth has given you details of the Kataboola experiment together with basic costs, etc.

My function this morning is to endeavour to give you the benefit of our experience this year from the practical angle and I hope this will be of assistance to you in planning and organising next year's spraying programme.

My remarks will apply chiefly to tea recovering from pruning but I will deal very briefly at the end of this paper with the specific problems of tea in plucking.

Equipment.

The equipment used in this year's trials is manufactured by the Four Oaks Spraying Machine Company of Sutton Coldfield, Birmingham, and is of the battery knapsack type consisting of a charge pump and a number (usually 8—12) of pneumatic pressure retaining knapsacks.

Many of you already know this equipment but for the benefit of those who do not, I will briefly describe it.

The central charge pump is a simple combined air and water pump and services the knapsacks with both air and spray fluid. At the start of operations each knapsack is charged with air to 30 lbs. pressure, then spray fluid pumped in to bring the pressure up to 75 lbs. This gives approximately 2½ gallons of fluid. These are manufacturers recommendations but in practice we have found it more satisfactory to work on pressures of 40 to 90 lbs. which gives approximately 2½ gallons fluid.

In the knapsack cylinder itself a rubber ball floats on the surface of the liquid, and when all the liquid is expelled, the ball seats on a valve and retains the original air pressure in the cylinder. Subsequently it is only necessary to pump in the correct quantity of spray fluid which takes about a minute, although the air pressure must be periodically "topped-up."

At the end of the day's work, each cylinder should be cleaned out and sufficient clean water pumped in, to take the air pressure directly off the rubber ball.

The advantages of this type of equipment over other knapsack sprayers, lie in the fact that labourers have both hands free of spraying purposes and that no pumping action is necessary on their part.

Each knapsack complete with equipment, weighs about 19 lbs. and with 24 gallons of spray fluid the total weight is approximately 42 lbs.

Generally the standard equipment used this year proved satisfactory but there are modifications which would be helpful under Ceylon conditions, and suggestions have been passed on to the manufacturers. The most important of these refers to the charge pump which has not proved very satisfactory for pumping air at upcountry elevations. This is due to the rarified atmosphere together with the fact that a combined pump can never really be efficient as an air pump. It may well be more satisfactory to have a simple water pump for spray fluid, and a ear foot pump or factory compressor to provide the air.

It is advisable to pass all water through a 100 mesh sieve before mixing takes place in order to prevent nozzle blockages.

As many of you are aware efforts have been made to increase the speed of spraying by the use of a small boom attached to the end of the spraying lance, which would enable two rows of tea to be sprayed by a labourer walking between the rows. In practice, however, this modification has not proved satisfactory for two reasons:—

- (1) Labourers always tended to concentrate on one row only, the spraying of the other row being left more or less to chance.
- (2) The boom proved too unwieldy on the difficult terrain experienced on estates, and the quality of the work suffered.

In the circumstances we consider that in the case of tea recovering from pruning it is much more satisfactory to use a single lance which enables a labourer to spray each bush carefully.

The question of suitable nozzles is an important one but unfortunately we are not yet in a position to make definite recommendations. It is important to have a low volume nozzle in order to cut down the quantity of water to be used per acre and low volume spraying under your conditions has the further advantage that the leaf is dry in a very short time and there is less likelihood then of the copper being washed off.

This year's work has been carried out with Teejets, the type recommended for use with the boom, and which give a fine fan shaped spray. For use with the single lance however it is not perhaps the ideal nozzle and we are at present testing prototype nozzles which give a wide hollow cone type of spray. We hope that one or other of these, although necessarily of a greater output than the Teejet, will speed up the work of spraying.

Perhaps those that are interested in this question of nozzles will register their names with the Tea Research Institute and we shall be pleased to notify such people of recommendations in due course.

Organisation in the Field.

Good organisation is very important indeed, and if efficient, will materially reduce the cost per acre. The whole job should be properly planned beforehand and not just left to chance. When planning, the principle to bear in mind is that the charge pump should be kept as near the spraying labourers as possible. The time spent by labourers returning to the charge pump is all dead time and should be cut to the minimum.

Before work commences I suggest that you walk over the fields to be sprayed and plan out in your minds eye, the various positions for the charge pump and the areas, or blocks to be covered from each position. The question

of water must be taken into account when doing this, as the position of the charge pump will to a certain extent be determined by the availability of running water.

There are nearly always streams to be found in most fields and where such streams cross the paths, will be obvious charge pump points. Some portions of fields may be rather tricky and the difficulty can be met quite cheaply in various ways.

- (1) Existing streams can often be diverted down field drains to points where the water is required.
- (2) Containers such as 40 gallon oil drums with the tops removed, or concrete tanks, can be set into the ground beneath drains and surface water collected by means of lengths of bamboo. In areas of reasonable rainfall you will find this most efficient. At Kataboola a number of areas were served with water by this means and in 3½ months we only once had to fill these drums by hand.
- (3) In areas where spraying is being carried out from roads or where paths are good, a small two wheeled hand truck can be used for carting water. I know of one estate where such a truck was made up from scrap material for Rs. 30/-.

When water points have been fixed, pits should be dug to facilitate the collection of water, drums dug in and bamboo set in position. After the first one or two spraying rounds it may be found necessary to put in further water points, or alter the organisation somewhat in the light of experience. This can easily be done however.

Labour.

I would emphasise here that it is essential to select your most reliable labourers since it is almost impossible to check up afterwards on the quality of work and the only real criterion of efficiency is the result achieved.

It is important, as far as possible, to keep the same men on the job throughout and a little extra financial encouragement will help matters considerably as well as assist the quality of the work. Such financial encouragement can take several forms — such as paying pruners rate, a bonus on the quality of the job, or a combination of both.

Every effort should be made to make the labourers aware of the importance of their job, and to try and stimulate their interest.

That Tamil labour will react to such encouragement and propaganda, has been proved at Kataboola where the quality of work generally has been good, the daily kanaks high, and the turn out among the regular spraying labourers almost a 100 per cent despite weather conditions.

Supervision.

This question of supervision is an all important one and cannot be stressed too strongly. But this I mean, the actual field supervision, the kangany or K.P.'s in charge of the spraying gangs. It is useful of course if an S.D. can look in every now and then and keep an eye on the work but this form of supervision is not nearly so important as having good men in the fields.

This fact was shown up clearly on one small field at Kataboola where a Kangany with a small gang was left with little supervision. The quality of the work was bad and parts of the field were quite severely infected with blister blight. The kangany concerned was admittedly a bad choice but the presence of a good K.P. would have made all the difference, and in fact this mistake was immediately corrected.

The moral of this story is that small fields should be as well supervised as large ones.

Mr. Portsmouth has given you the basic costs at Kataboola to the 31st October but at this point I would like to give you some idea of the cost of staff supervision for the same period. On this experiment the equivalent of two K.P.'s were employed and assuming that their monthly pay averaged Rs. 80/- each, the total cost in 3½ months would be Rs. 560/- or approximately 20 cents per acre per round sprayed.

I implore you therefore to put your best men on this job. You won't regret it!

Labour Organisation.

The optimum size of a spraying gang is probably about ten spraying men, two pump men and a supervisor. One charge pump should be able to keep pace with as many as 12 spraying men but such numbers are rather a strain on the supervision. Within limits, the larger the gang, the more economical the cost per acre, since the pump men and supervisor are static, anyway, whatever the size of gang or acres sprayed per day. For this reason large fields will usually work out cheaper than small ones.

Labourers should spray two rows of tea each and on the flatter areas it will be found most convenient if the whole gang spray long rows up and down between paths or paths and boundaries, etc. On steep slopes, however, it is easier to work by blocks between field drains and one or two labourers can spray short rows within each block. With this method the amount of clambering about is reduced to a minimum and there is less physical strain on the labourers.

On exceptionally steep areas, such as we experienced on one field at Kataboola, it may be necessary for labourers to walk up first, and spray down the slope only. Apart from ease of working this also ensures that each bush is sprayed from above and that the leaves receive a top cover. This is an important point and I would stress again that bushes should be sprayed from above and not from the same level as the bush, as may happen if labourers are working up very steep slopes.

Sprayers should return independently to the charge pump for filling purposes, thus ensuring a continuous stream of men backwards and forwards and cutting waiting time at the pump to the minimum. It is also helpful if labourers are provided with sticks to mark the point at which they have left off spraying. If some such method is not adopted there is always danger of bushes and even complete rows being missed.

I always like to see two extra knapsacks with each gang which can be filled at slack times and carried by the second charge pump man to the spraying labourers working furthest from the pump. The empty container can then be brought back to the pump for refilling once more. This helps to cut down unnecessary working time by spraying labourers and to speed up the job.

Spraying Technique.

The aim of low volume spraying should be to obtain a fine even cover of spray fluid on the susceptible leaf, and not to drown the bushes. This fine cover is best obtained by holding the lance a foot or so above the bush. If the lance is held too low, a patchy cover results.

Effects of Weather.

You will hear from Dr. Haworth later today that a proportion of copper is held by a tea leaf even when sprayed under conditions of heavy rain.

That this amount of copper is effective against blister blight has been borne out in practice at Kataboola and other estates.

This is a revolutionary development in crop protection technique, and is of the utmost importance as far as the control of blister blight is concerned. If spraying had to be confined to dry weather, it would be quite impossible to carry out control measures in many areas of Ceylon and probably quite uneconomic on the remainder where the rainfall is less. As it is however we are able to recommend continuous spraying whatever the weather.

The effect of wind should be mentioned here, as high winds tend to blow the spray away before it reaches the bush, and blister infection in two trials this year was traced to this cause. Wind-drift must be counteracted by holding the lance closer to the bush and slightly windward.

Although, as I mentioned earlier, low volume nozzles should be used, they must give a forcing spray, as in the case of the Teejet. Very fine nozzles are not suitable, as the spray produced drifts badly even in light airs.

Application Recommendation.

The fungicide used in all trials this year has been Perenox and it appears that the optimum dilution is 4 ozs. to 10 gallons of water. Generally, mixing will be carried out in a 20 gallon container in which case 8 ozs. of the fungicide will be used to a mixing. Suitable measures to contain the correct quantity of fungicide can easily be devised.

The quantity of spray fluid to be used per acre will vary according to the state of growth of the bush. In the early stages, 12 gallons to the acre should be found sufficient to cover new growth but after 6 to 8 weeks the quantity applied should be gradually increased up to 16 or 17 gallons just before tipping.

These figures are only a guide and hard and fast rules cannot obviously be laid down because so much depends on the size of bushes and the speed of growth. The real criterion is "cover," and if the gallonage per acre is not sufficient to give this "cover," the application rate should be increased.

The first spraying should be given before any bud development is observed — normally about two weeks after pruning — and where possible it is advisable to carry out the first four rounds at four day intervals. Subsequent rounds should be at seven day intervals.

Output.

In the early stages of spraying it is quite within the powers of a labourer to spray an average of 1½ acres per day, though towards tipping this may fall to about 1¼ acres. On the basis of 1½ acres per labourer, a gang of ten spraying men will spray 15 acres per day or approximately 90 acres per week.

Tea in Plucking.

The principles outlined previously apply equally to the spraying of tea in-plucking. The quantity of fungicide should again be 4 ozs. to 10 gallons of water but 12 gallons of spray fluid per acre will be sufficient to cover the plucking table. Spraying rounds can be carried out at weekly or up to 10 day intervals and should take place immediately after plucking, to ensure the minimum copper residue at the next harvest.

I would like to mention once again at this point, the question of the double boom. On flat areas and where tea is planted in the normal way, such a boom carrying two nozzles, could be used satisfactorily and will speed up the daily output. However, conditions vary so much on estates that we must necessarily be vague on this point, and can only suggest that you experiment for yourselves.

The single lance, for the reasons I mentioned earlier, is the safest and we are confining our recommendations to this.

It is obvious that on most estates it is impossible, from the labour point of view, to spray large areas of tea in plucking, but it should be quite feasible to give protection to first year fields in bearing.

Conclusion.

Agency houses, when consulted last year by the Tea Research Institute, stated that they were prepared to spend up to Rs. 60/- per acre on the protection of tea recovering from pruning, provided that satisfactory results could be assured. The Kataboola experiment has achieved this target. I have also seen all the smaller experiments carried out on other estates and can assure you that spray protection is fully reliable. The increase of crop resulting from the spraying of first year tea in bearing also, in my opinion, shews that spray protection is desirable.

I do, however, stress the fact that the long term effect on the health of the tea bushes, constitutes the real value of spray protection.
