TEA MANUFACTURE

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Dr. Gadd and Dr. Eden have dealt with the factors which influence the health and vigour of the tea bush and its harvest. My immediate purpose is to point out how intimately these factors are connected with the ultimate success of manufacture. The quality and make of Ceylon teas are closely linked with the system of plucking to a full leaf. All our analytical work has shown that the bud and first leaf are the richest in all the precursors of liquor. The second is not far behind but the third or full leaf, although richer than the older leaves, is a poor relation of two leaves and a bud. The stalk between the second and third leaves is deficient in all respects. There is a good deal of chemical evidence that fibre and woody tissue is very rapidly laid down at the stage of development corresponding to the full leaf. Practical experience leaves no room for doubt that fibrous teas are the direct result of overmaturity in some form.

The full leaf, when free of Blister Blight, is of infinitely more value to the bush than it is to the teamaker. Dr. Gadd has pointed out that 90 per cent of the weight of the harvest come from air or rain and only 10 per cent from the soil and manure. Dr. Eden has told you that even the response to manure, depends on the amount of leaf on the bush.

It is therefore the full or third leaf which when left on the bush, is the Philosopher's stone for which we seek, and is literally capable of transmuting base leaf into good tea. Dr. Eden quoted figures obtained from his field experiments which

shew that the harvest of a tea bush is directly proportional in weight to the amount of mature leaf on the bush.

The close connection between our system of pruning and plucking and our manufacture was brought home to me by my visit to the North Indian and Pakistan tea districts in June of last year. In North India they start the season's plucking with a large weight of mature leaf on the bush and harvest everything which grows above the plucking table. In Ceylon we start a cycle of growth with very little foliage and build up the size of the bush by taking two leaves and a bud for the factory, and leaving one leaf for the bush by a system of plucking to a full leaf. Coarse plucking therefore has disastrous effects in Ceylon, compared to countries where they first ensure that the supply of foliage leaf is adequate for the crop to be produced. When the amount of foliage is thus assured, coarse plucking can be, and is practised freely, without detriment to the bush.

If we want to pluck coarse in Ceylon, we must change our technique of manufacture because methods designed for two leaves and a bud do not give satisfactory results with coarser leaf. As an instance I give you our system of withering. We wither much harder than any other producer and we can get a really tight twist and good make as a result. It is quite impossible to get a hard wither on anything more than two leaves and a bud, as the coarser leaf withers at such a different rate. If we want to pluck coarser we must take softer withers and in effect copy the North Indian method of manufacture.

Our agricultural and manufacturing methods are therefore both based on two leaves and a bud and it is essential that this should be clearly realised. In passing I may say that young banji leaf does not compare unfavourably with normal flush so long as it is taken before it hardens.

The North Indian pluckers appeared to me to be working to a much higher standard than we reach in Ceylon. Although plucking is coarse they do not pluck below the table or take immature leaf. Few planters in this hall, will, I imagine, dispute the statement that our pluckers have lowered their standards of work, but being a slow and insidious process it is difficult to assess. It seemed to me that the North Indian system of allocating definite rows in each field to individuals or families, has forced home the fact that bad plucking is against their own interests. North Indian planters are convinced that this system makes supervision much easier and more effective. Some estates in Ceylon have adopted this practice with success and I suggest that here I have given you material for the discussion which is to follow these papers.

Whatever wrangles arise over terms and conditions of employment there is no excuse for lowered standards of work, and it is sincerely to be hoped that those who claim to represent the interests of tea estate labourers will help to impress upon pluckers, the fact that by lowering the standards of work they are not only sending leaf to the factory which spoils our quality, but also robbing the bush of the very means by which it can earn next month's and next year's rice.

From the point of view of manufacture there is so much difference between a bud and two leaves and coarse leaf, that it is essential that flush should be harvested before maturing processes are too far advanced, which mean close and regular

plucking rounds. I know full well that there are many difficulties in the way of these ambitions, but I know just as well that it is useless to attempt to improve the quality of tea by improved manufacturing technique unless the standard of leaf is maintained. Having manufactured leaf from many of Dr. Eden's manurial experiments I can also assure you that manure, whether organic or inorganic, and in large or small doses, has very little apparent effect on quality.

Climatic conditions, jat, and agricultural methods, are the factors which exert the major influences upon the quality of tea and in the factory the main tasks are firstly to prevent spoilage, and secondly to produce the style required by the particular market in which the teas are sold. In general I would say that insufficient attention has been paid to the second task, and I am particularly glad to see Mr. Horne here today. I hope that the tea trade will co-operate in future conferences and also publish more information along the lines of the Market Review, for which Mr. Horne is at present responsible.

I therefore pass on to the theme of avoiding spoilage and conforming to market requirements.

I do not believe that the normal technique of manufacture, as practised in Ceylon, causes the actual loss of very much inherent quality. During the past fifteen years I have carried out, or seen, experiments with cold withering, freezing of leaf, cold rolling, high and low temperature fermentation, low temperature and vacuum drying. I have not seen any concrete evidence that any marked amounts of desirable substances are conserved by such treatments or that conversely, the ordinary methods result in any serious loss. It is possible to accentuate certain qualities, but in the long run the market wants the straightforward ordinary good quality tea. There are demands for limited quantities of specialised teas but these are usually associated with marks, districts and seasons.

All of us with even as little as fifteen years' experience of the tea industry, can recall several new ideas or machines which have been hailed as revolutionary, and claimed to put pence per pound on the value of the product. Most, if not all, of these ideas and machines are on the scrap heap and the reason usually is that some alteration of the traditional form of tea was involved. In many cases a particular specialised demand was met, but as soon as this limited demand was satisfied, the excess production was unfavourably received by the bulk of the trade. It is the intention of the T.R.I. to pursue research on new methods of manufacture as a long term policy but that is another story which I will not attempt to tell today.

I will not dwell much longer on market requirements, as Mr. Horne will have more to say on this subject, but I must remark that they are more than usually difficult to understand at the moment. I was astonished at the enormous amounts of light flaky teas which are being produced in North India and was better able to understand the complaints I heard in London in 1946 from Blenders who were having difficulty with packing these teas. Although, as a Research Worker, I curse the necessity for adhering to traditional appearance, I must admit that the demand for it is very much to Ceylon's advantage. When the world's markets accept light, flaky and fibrous teas, and refuse to pay a premium for make and quality, I shall consider it high time to ask Dr. Eden if he can find me a job in East Africa.

The rest of my address will deal mainly with the principal safeguards against spoilage in the factory. I am laying myself open to the charge of teaching Grandmother to suck eggs but I hope that, if I provoke, it will stimulate the discussion which is to follow.

First and foremost, I put damage to leaf before spreading as the major cause of spoilage. Usually, it occurs during transport, but I have known it to occur between weighing in the factory and spreading. If leaf comes to the factory at 40 lb. per bag, it should not be crammed at 80 lb. after weighing-in, for transport to the lofts. Space must be left for spreaders to stand, as if they walk about over the top of the leaf spread thickly along the whole length of the passage between the tats, they can do a tremendous amount of damage. Labourers seem to be much less careful about handling leaf than they were before the contract period, and I think that leaf damage has increased considerably. Recently, I saw a most excellent system for leaf transport on Nayabedde Estate and I hope that Mr. Francillon will give us permission to publish photographs and details in the Tea Quarterly.

With our hard Ceylon withers the avoidance of damage is essential, as damaged tissue dries out during withering, and is not only useless, but spoils infusions. In North India where the wither is very light, damage is of little or no account. I found that 50 per cent of damaged leaf was quite common, but it was scarcely noticeable after their wither. Under Ceylon conditions we cannot afford much more than 10 per cent damage, but I have frequently found much higher figures in recent months.

The North Indian Research Station at Tocklai has shewn that bacteria multiply rapidly on wet leaf and may cause soft liquors and dull infusions. From practical observations I am inclined to think that we may run into this trouble in abnormally wet weather, and advise the rapid removal of surface moisture at all times. Infection with harmful types of bacteria which is apt to be troublesome in the later stages of manufacture in North India, appears to be of little importance here and, judging from our experiments, there is no spoilage from this cause in a well run Ceylon factory. We have indications that maltiness may actually be due to a slight bacterial fermentation secondary to the normal enzymic fermentation. Investigations on this subject are being carried out at St. Coombs, but I doubt whether we can gain much control over such a secondary process. My advice, based on our present knowledge, is to adhere to the normal method of washing down machinery and equipment with plain water, and to avoid the use of disinfectants or detergents. Tea machinery and equipment should be designed and fitted to avoid accumulation of filth, and if plain water is not sufficient to keep the rolling and fermenting rooms clean, steps should be taken to remedy the basic cause rather than to resort to disinfectants and cleaning agents.

Although damage before withering is probably the major cause of direct spoilage, I believe that rolling is the process which largely determines the amount of inherent quality which is brought to the cup. Given a free hand to use any sort of machinery, it would be a fairly straightforward task, but while we are limited by the necessity for maintaining traditional appearance, the process demands much care and attention.

Firstly I think it is essential that the flush should be kept entire for at least one roll, because the wringing action is dependent on friction between leaf and leaf and the larger the units, the better the twist. Once small dhool is formed, nothing further can be done about twisting action. It is possible to hammer out the juice, but the effect on appearance is too marked for present purposes. As soon as the leaf is well twisted, or shall we say, thoroughly wrung out, rapid dhool production may proceed; especially if a high percentage of small B.O.P. and Fannings is required. If, however, the aim is to produce high percentages of large leafy grades, or long orange pekoes, the twisting action must be prolonged.

Since twisting action is largely a matter of friction between leaf and leaf, it follows that leaf movement or circulation in the roller is of paramount importance. The pressure cap tends to suppress circulation and thus defeats its own object of improving twist. If, however, a large smooth fitting is fixed on the door of the roller and this fitting is large enough to displace leaf as it goes round and round inside the jacket, circulation can be maintained under pressure.

Such a fitting must not, however, set up a pressure against the jacket as in Epicyclic-pressure rolling. This can be prevented by regulating the slope of the sides of the fitting and keeping it below 45° from the horizontal. If the faces of the fitting are anywhere steeper than 45° they will crush leaf against the jacket. The figure which answers these requirements is a true cone with a triangular cross section and base angles less than 45°.

To obtain a brisk circulation of leaf the displacement of the cone should be as large as possible. The base of the cone should, however, clear the roller jacket by one inch otherwise the jacket may jam against it. The height should be from five to six inches according to the size of the roller. The top of the cone should be slightly rounded.

(See Plates I and II).

The plain true cone is very satisfactory for first and second rolls when used in conjunction with short types of battens such as Lamont and Crescent which run out at the door. With longer types of batten such as the M & S, which do not run out at the door, the base of the cone should be fitted to the battens which must then run for a short distance up the side of the cone, and gradually merge into it. We have co-operated with the Colombo Commercial Company in the production of a cone suitable for M & S battens and this arrangement may be used for all rolls.

When a true cone is fitted to a roller to maintain circulation under pressure, our experiments indicate that there is no objection to keeping the pressure applied throughout the rolling period, and that it is no longer necessary to raise and lower the cap at intervals.

It is most unfortunate that the word "cone" was ever used in conjunction with the fittings which set up a horizontal pressure and roll leaf against the jacket of the roller instead of the table. For this process we have employed the term "Epicyclic Pressure" or E.P. rolling and we propose to adhere to this term and to describe the gadgets used as "E.P. fittings." There is not sufficient time at my disposal to go into very much detail, and so I will summarise the present position as I see it.

1. First and foremost E.P. rolling is only suitable for use with good standards of leaf. A very small amount of coarse leaf spoils the

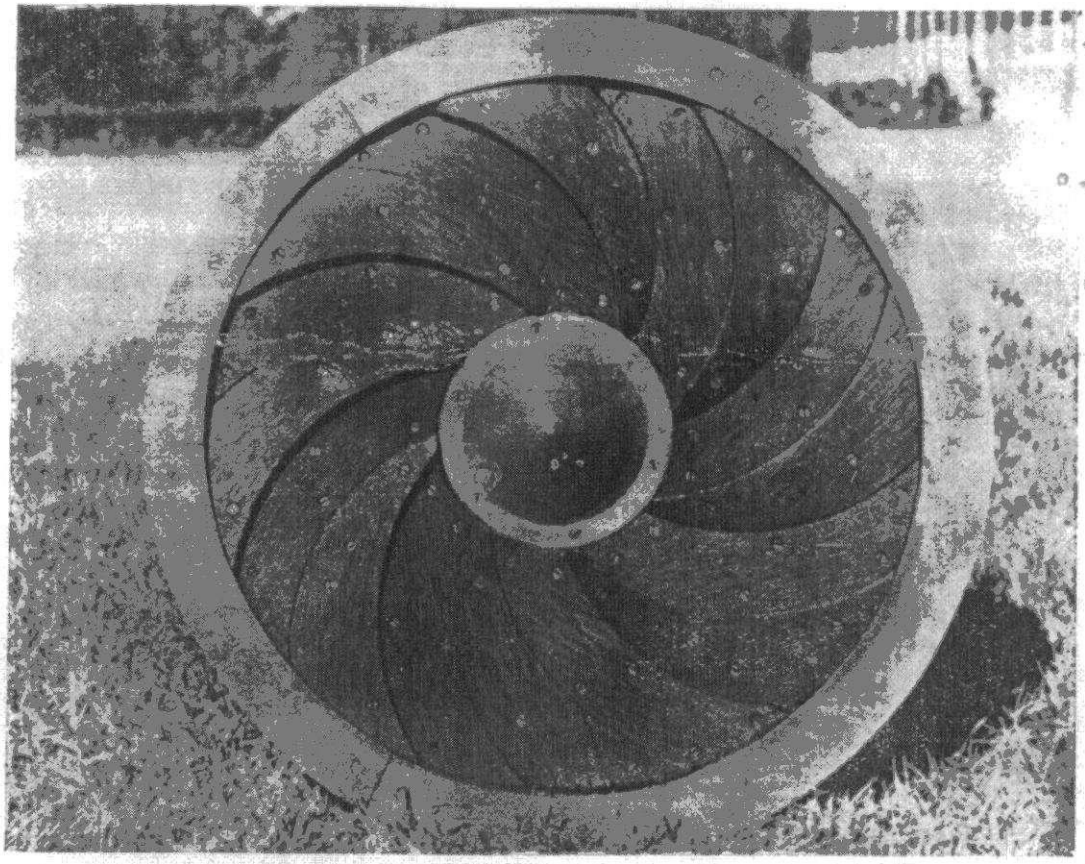

PLATE I.

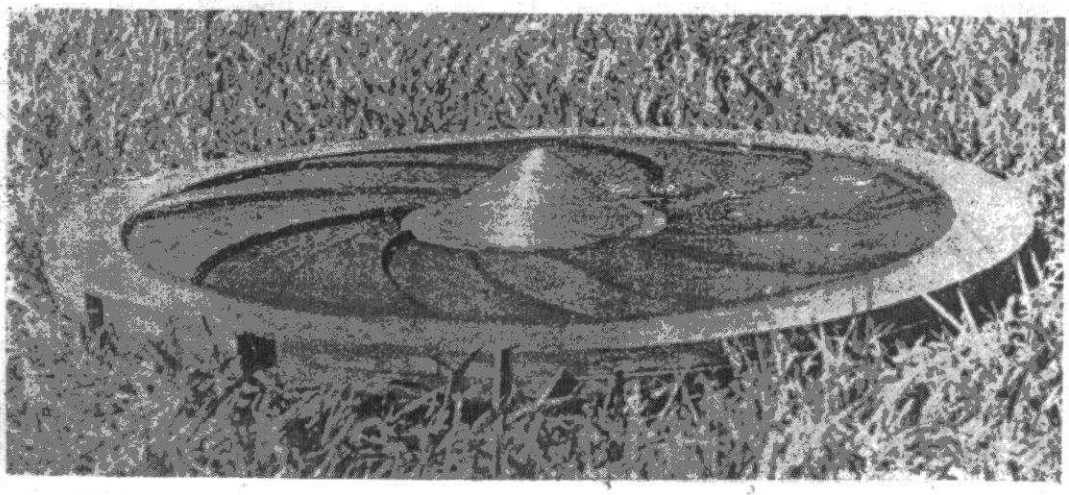

PLATE II.

appearance of E.P. teas. If there is any fibre in the leaf this method of rolling tends to hammer it out and accentuate redness.

2. It requires a good standard of wither.

3. I regard it primarily as a method of saving labour and machinery. It follows, therefore, that if the rate of charge to E.P. rollers has to be reduced to obtain satisfactory results, its advantages are greatly diminised. I am critical of commercialised forms of E.P. rolling on this account.

4. The method is best suited to the production of smaller types of tea such as B.O.P. and Fannings. It cannot be expected to produce large leafy pekoes or long orange pekoes.

5. The liquoring qualities are generally acknowledged to be good. With good leaf the liquoring quality will compensate for any slight roughness of appearance, especially if B.O.P. and Fannings are the main grades. The presence of coarse leaf however, upsets this balance.

E. P. rolling is therefore a suitable method for producing good liquoring B.O.P.'s and Fannings of average standards of appearance, which is precisely what the London Blenders demanded before the war.

At the T.R.I. we have evolved two very simple types of E.P. fittings, one for first rolls, and the other for second and third rolls. They allow normal roller charges to be employed, and have been in commercial use for two years with quite satisfactory results. We believe them to be superior in design and performance to commercialised forms of fittings.

The development of E.P. rolling is clearly a matter of market requirements and our advice to estates is to avoid further conversions until the position is clarified. We will publish our findings and recommendations as soon as we have obtained sufficient clear evidence from actual sales in the open market. E.P. rolling produces a definite type of tea, and, as such, must be produced in quantities commensurate with demand. It is rash to make predictions apart from the uncertainty of the future, but I have in mind the possibility that batten and pressure cap rolling will best suit the requirements of the major number of estates selling in Colombo, and that E.P. rolling will eventually prove to suit the demands of the London Blenders. The only possible policy is "Wait and See."

In dealing with E.P. rolling, I have really switched back to the subject of market requirements, from my main theme of spoilage.

To continue with spoilage I venture the opinion that in firing, grading and transport, there is relatively little loss of quality when normal care and supervision are exercised, and suitable materials are available for packing. There are one or two minor points, however, which are sometimes overlooked, although we have drawn attention to them in our publications.

The practice of storing tea hot from the driers seems to be fairly common. It is most essential to cool teas off very thoroughly as they come from the drier. Tea retains heat for very long periods when heaped or stored in boxes, and loses markedly in quality. Exposure in cooling should not, on the other hand, be too prolonged as the moisture gain will be excessive. It should be possible in a normally equipped factory to fire, cool, sift and pack, the major grades, keeping the moisture

content below 4 per cent without resource to final firing. Final firing is at the best a necessary evil, but must be regarded as essential when the moisture content is in excess of 4.5 per cent.

I also strongly recommend the practice of firing big bulk on the slowest pulley with a thick spread. Big bulk may be slightly soft in the centre if fired in the same way as dhools.

In the process of grading, there are more questions of market requirement than there are of spoilage, but I express the hope that stamped aluminium will soon again become generally available, as its velvet like surface is much kinder to dry leaf than is wire mesh, and it avoids much greying.

Finally I implore you to use your moisture content apparatus if you have one, and if not, to obtain one as soon as possible. All tea makers should be capable of using this apparatus and the time involved is negligible. If teas are sent away from the factory with too high a moisture content, they will deteriorate no matter how much care and attention has been devoted to their production. As competition becomes keener, deterioration in transit will be traced back, and marks with a reputation for "going off" avoided like the plague.

In these days of universal depression I would like to end on a cheerful note. My tour of North India and East Pakistan has convinced me that our difficulties are by no means unique. Our cost of production still compares very favourably with that in North India, and with our well equipped factories, and our inherent quality, we are well able to stand up to the keen competition which we must except to the near future.

If our Labour Force and Government will co-operate with us in maintaining standards, our future is assured for many years to come. Since the Tea Industry is such a vital part of the economy of this small Island, we may, with reason, hope for such co-operation.

Chairman : I will now ask Mr. Horne to give his paper.