

DROUGHT AND PRUNING*

F. R. TUBBS.

It is difficult to obtain any comparable experimental data upon the subject of drought, and the scientist is, therefore, compelled to base his recommendations upon general principles rather than upon particular data.

Under normal circumstances the tea bush absorbs from the soil approximately the same amount of water as it loses to the atmosphere through its leaves. When droughty weather starts, this equilibrium is disturbed at both ends, so to speak, the absence of rain cutting off fresh supplies of water to the soil, while the changes in the temperature and humidity of the air speed up the loss of water through the leaves.

American forestry investigations suggest that under normal conditions trees draw their water supply mainly from the upper layers of the soil where the moisture, aeration and supply of nutrients (especially nitrogen) are most favourable. When atmospheric precipitation ceases these layers are dried out by the combined action of the roots and of direct evaporation.

If the process is gradual the roots develop into lower layers of soil in search of moisture, while the delicate absorbing surfaces on the rootlets in the drier layers become desiccated and absorption by them ceases. If the soil dries out more quickly than the roots develop downwards, the tree dies; roots will not grow through dry soil in order to reach wet soil at a distance.

It appears that under forestry conditions three layers of soil, loosely speaking, may be recognised. Firstly, we have the upper soil, whose water content is influenced mainly by atmospheric conditions, then a layer in which the withdrawal of water by the roots of the trees is the predominating influence, and thirdly, the soil below which is *relatively* slightly affected by changing conditions.

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It is probable that a similar division, perhaps not so well marked, may be made in tea soils, and, if so, we find an explanation of drought conditions persisting after rain has fallen. Unless the rain is heavy a moist upper layer is created, in which the roots are still inactive, while the layer below is still relatively dry. When this occurs the recovery of the trees will not be found to commence immediately the conditions become apparently favourable to normal growth.

It is obvious that the depth of the root system is an important factor affecting capacity to resist drought. Shallow rooting may result from rapid erosion, an impenetrable subsoil, a water table that is normally high, and from the presence of the major part of the soil nutrients in a well-cultivated shallow upper layer of the soil.

The latter cause probably provides the explanation of the observation made during the recent drought, that small-holding tea in some cases resisted the drought better than estates where the soil had been forked and manured.

The greater damage inflicted by the drought upon tea in hollows is probably due to a high water table resulting in a shallow root system. In general an abundant supply of moisture and nutrients tends to produce a relatively dense root system, while a poor dry soil results in the root system being far more extensive.

The full explanation of the root action of tea under varying external circumstances must await root investigations, but these are both difficult and tedious and will demand a good deal of time to be spent upon them.

All gradations may be found in the extent of the injury according to the degree of water deficit. At one end of the scale we have the temporary flaccidity of the young and tender shoots upon the bush, such as may often be observed at mid-day under conditions of intense insolation, more especially when the weather suddenly becomes hot and dry after being moist and humid for some time.

An hour or two later the shoots appear normal once more, the only damage done being temporary slowing down of their vital activities. At the other end of the scale we have the case where the water deficit is sufficiently great to cause permanent damage to leaves, branches, and even complete bushes.

When the tea is actually in the grip of the drought we may take measures to enable the income of the bush to balance with its outgoings. It is too expensive to add water to the soil, so that loss of water from the bush must be reduced where necessary by the removal, partial or complete, of the leaves through which the bulk of the water is lost. In other words pruning is the last defence against drought.

This statement must not be interpreted as a general recommendation of dry weather pruning, but merely as an example of a case in which special circumstances call for special measures.

Before I pass on to pruning in general I would like to remark upon the after-treatment of bushes that have suffered severe drought damage. Where only the uppermost portions of the frames have died, a normal pruning to remove dead wood is sufficient, but where only one limb or a few inches of stem above the soil level remain alive, it appears to me that it would be best to collar prune the bush and to rebuild the frame anew.

Turning to pruning, it being impossible to go deeply into the subject, I will utilise the time available to stress one or two points that I consider really important.

The other day I was glancing at a book on the pruning of temperate trees, and came across this statement. "The best pruning is that which results from a definite purpose or plan" It is worth our careful attention, for it is undoubtedly true. Have we a plan on which we are working in order to attain definite ends? Before we can work one out, it is necessary to have a clear idea of the results we wish to accrue from the pruning. These, I suggest, are:—

- (1). The maintenance of a height that will permit of easy plucking.
- (2). The application of a stimulus to more vigorous production of leaves and shoots.
- (3). To maintain the frame of the bush in a healthy condition.
- (4). To utilize the acreage of the estate.

The first two aims may be attained by almost any form of pruning, but the latter two require the development of a plan if we are to achieve them.

No man with unhealed wounds all over his body can be described as healthy, and so it is with the tea bush. We must, therefore, seek to ensure that the cuts made during pruning shall heal over as quickly as possible.

To do that it is necessary that so far as is humanly possible no protruding snags shall be left to die back, and provide areas where disease organisms can establish a footing.

Knots provide a more difficult problem — to remove them or not. I think, however, the difficulty largely disappears when we consider the general question of maintaining the health of the frame. No matter how carefully we tend the health of the branches, a time will come when they are no longer as vigorous as a younger branch would be. When this occurs we should be in a position to replace it.

No exact period can be assigned as the useful life of a branch for it depends to a great extent upon variable external factors. But on each estate it should be possible to make a fairly accurate estimate based on past experience, for use in developing the plan on which the pruning is to be based.

For example, if it is reckoned that the useful life of a branch on an estate working on a three-year cycle is twelve years, it follows that efforts should be made to arrange for the replacement of about a quarter of the branches, at each pruning, by younger branches. Only by such a system of replacement can the occasional necessity for drastic measures be avoided. It is, of course, impossible to make every bush fit into a system exactly, but that is the goal which should be striven for.

Suitable young branches to take the place of old ones will not develop if the pruning level is too high, so it must be sufficiently low to stimulate the production of new shoots from the neighbourhood of the ground level. This means the abandonment of the process of pruning up and up until a drastic cut down is necessitated, and the substitution for it of a system of pruning at a moderate height in successive cycles.

In passing, I would like to mention the somewhat controversial subject of root growth. The amount of this varies a great deal with the jât, but even on high jât fields there is a certain amount.

I am no advocate of turning the field into a jungle, but I do maintain that it is a great waste to cut off healthy red wood just because it does not arise from the central stem. Provided that it is not so situated as to interfere with cultivation, I see no reason to prevent Nature's attempts to rejuvenate the bushes.

Root growth provides one method of maintaining and increasing the spread of the bush, and this brings me to the last subject in my list, namely the utilisation of the acreage of the estate. The ideal is not to have a good cover of tea at the end of the cycle only, but throughout the cycle, and this can only be done by attention to our system of pruning.

I am afraid that there is little hope of producing a permanently large spread as long as we maintain the methods of pruning so common today, in which either the whole or the greater part of the young spreading branches are removed below the pruning level at the end of every cycle.

To obtain a good spread it is necessary to utilize the pruning process in encouraging the growth of the branches which are developing in the direction which we desire, and not to allow it to result in destruction.

In passing, I will mention two objections that I have heard to the policy of leaving all low side branches below the pruning level. It is stated that no immediate increase in yield will result from leaving them, and I agree. But let us remember that we are attempting to plan our pruning in order to obtain results that are not necessarily immediate. If the side branches are left to develop they will become useful portions of the frame, besides contributing to the reduction of weeding costs and of erosion. The truism that the best cover crop is tea should be remembered, and also acted upon.

I will admit we cannot expect to attain our ideal completely so long as the bushes are pruned at the rate of one every three minutes. However, I have tried to indicate to you today some of the points to be considered in making out a plan on which to base a system of pruning that can be carried out on the money normally available for the purpose. Only by asking ourselves what we wish to result from the pruning can we develop the necessary "purpose or plan."