SOME FACTORS CONTRIBUTING TO POOR RESULTS WITH V.P. TEA IN NURSERIES AND CLEARINGS

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(*This paper was read by Mr A. V. Richards, who also answered the questions.*)

In this paper a brief account will be given of some factors contributing to the poor results occasionally obtained on V.P. nurseries and new clearings, and how these may be rectified. These will deal mainly with soil conditions and horticultural practices. No reference will be made to the subjects of nursery manuring and control of pests and diseases, as these could be dealt with by other speakers at the Conference.

The following subjects relating to the vegetative propagation of tea will be discussed: Location of nursery sites and their soil characteristics; optimum shade conditions; type of cutting material; polythene bags and precautions in their usage; the planting, watering and treatment of cuttings in the nursery and of rooted plants in the field; and the selection of clones.

Site

Often a low-lying site, a legacy from the coffee days, is still made use of for a nursery because of its close proximity to water. Some of these sites generally have a high water table with the result that root development in nursery beds is restricted or inhibited. Low-lying flat areas frequently form traps for cold air, particularly in the higher regions—a condition which is not conducive to growth. It is not denied that a site close to a water source is of great advantage, but it should not be preferred, if other conditions of greater importance are not satisfied. A site situated in a warm- sheltered position should preferably be selected, if other soil requirements are also fulfilled, *e.g.* pH below 5.5, good drainage, light loamy texture, absence of parasitic nematodes and soil fungi.

A common cause of many failures is the use of heavy closely textured soils. Their physical condition is such that they can easily get water-logged during wet weather or if over watered. Impeded drainage causes cuttings to rot or form large or excessive callus and little or no root development. Mealy bugs are also often associated with this type of soil. A common feature of a closely textured soil is that it can pack up tightly, thereby lacking a condition for healthy root development *i.e.* air space in which to grow. It is not often realized that plant roots can only function if the soil is able to maintain a sufficient rapid exchange of carbon dioxide produced in the soil for oxygen from the atmosphere. An ideal soil is one that has a good water holding capacity but yet is well drained and sufficiently porous to allow good aeration. Though all other conditions of the nursery may be ideal, a pH of over 5.5 in the soil could alone cause failures. This could be rectified by treating it with a solution of aluminium sulphate at the rate of 8 oz of chemical per square yard of soil. Thereafter, if the pH is still above the minimum, subsequent treatments with 2 oz of the chemical per sq yd should be given every three months until the pH value is in the range for successful callusing and rooting of the cuttings—generally between 4.5 and 5.

A good soil can occasionally be destroyed by undue meddling or breaking up of lumps when it is very wet. Collection of soil for filling bags during very wet weather is accordingly not advisable.

It is generally accepted that eelworms can cause considerable damage to nursery plants. Though soil fumigation will largely control the pest in the fumigated nursery, precautions are not often taken to prevent risk of reinfestation from the surrounding area or through water. Reinfestation would mean that the plants transferred from the nursery would carry the pest with them and so distribute it in fields which may have been free of it.

Shade

The shading of cuttings while in the rooting bed is an orthodox practice, but it does not mean that all light should be excluded from the bed. In an experiment in which cuttings were placed under black polythene, though precautions were taken to prevent stewing, most of the cuttings died within a fortnight. It is, therefore important that the shade provided should not be too heavy to prevent photosynthetic activity of the leaves. With bracken fern the shade should be only just dense enough for the cuttings to be barely visible from above, while with coir matting adequate shade (15 to 25% light intensity) is provided by $\frac{1}{8}$" to about $\frac{1}{2}$" mesh widths depending on local climatic conditions.

Furthermore the light intensity should be gradually increased once active growth begins. The process of gradual reduction of shade and that of hardening off of plants gradually should not be ignored.

Cutting Material

Poor rooting and growth can be attributed to cuttings taken from bushes that have reached a reproductive stage, *i.e.* from shoots that are beginning to flower. This type of cutting produces flowers and excessive callus growth.

Polythene Bags

There is no doubt whatsoever that the polythene bag is much superior to the bata basket, but failures do sometimes take place if certain precautions are not followed. For instance if adequate drainage is not provided, results can be most disappointing. Drainage is best assured by having holes at the bottom and sides; holes on the sides alone are not sufficient as they can be blocked by adjoining bags. Sleeves *i.e.* with the bottoms open are used on some estates by consolidating the bottom layer of soil before it is filled. By intensive ramming an impermeable layer can be created at the bottom if the texture of the soil is not correct. Nevertheless sleeves are to be preferred as less labour is required in preparing them and if soil of the right texture is used the roots of the cutting will hold it in position when the sleeves are removed from the nursery to the planting site.

The purpose of providing holes or using open end sleeves can be lost if the bags or sleeves are placed on beds as hard as concrete. For successful results they should be placed on raised beds that have been well forked to ensure good drainage.

Beds should be made firm before cuttings are to be planted if good results are expected, but it would be contrary to reason for the bed to be rolled with a heavy roller. A good idea is to let the soil in the bed settle down for about 2—3 weeks before it is intended for use. The same practice is applicable with polythene bags.

Planting

For successful results it is important to make the soil firm before planting the cutting, and also to firm the cutting after insertion into the soil. Cuttings planted in loose soil or insufficiently firmed down, produce large callus formation or rot at the base. Where nursery beds are used, soil from drains should not be placed around

the base of the cuttings or collar rot will follow. Experience has shown that wide differences can exist at the time cuttings are planted. Cuttings put out at the beginning of or during the monsoon are not so successful as those put out towards the end of the rainy period. Warmth of soil, particularly in the colder areas, is a potent factor in encouraging quick rooting.

Watering

Over watering and not under watering is frequently the cause of innumerable failures. Unlike cuttings of many other species, tea does not tolerate very wet soil conditions, but requires high atmospheric humidity for rooting. Excellent results have been obtained under an automatic mist system which keeps the leaves covered with a film of moisture. The amount of water used for "misting" is much less than with other systems of watering. These units are ideal for experiments, but may be uneconomical of extensive propagation schemes. Almost identical conditions can be achieved by the use of a mist blower under high nursery shade which could maintain a thin film of water on the leaves at all times of the day.

Planting in field

Polythene does not disintegrate readily when buried in the soil, so that it is essential for the bag to be removed at planting if root restriction is to be avoided. Complete removal has given better overall growth than slitting the sides, in part or whole.

When stump planting was in vogue it was a standard practice to adhere to the nursery level when plants were put out, and there is no justification for altering this practice. Deep planting causes collar canker and death of the plant. Where mulching is done, care should be taken to keep the mulch away from the base of the plants or collar canker may occur.

Centering and Plucking

Frequent removal of flush by thumbnail pruning has been proved to retard root growth, and it is a good root system that is sought in areas subject to droughts. It is also possible that bringing a plant into plucking at a very early age may have a setback on its root development. Experiments are in progress to determine the effects of early plucking on the root system.

Pruning

Pruning which should not be a problem is unfortunately the cause of despair on a few estates where bushes fail to recover after the pruning operation. It seems that where good lungs have been left no casualties have occurred and normal recovery takes place. Observations indicate that vigorous growth of clones is accompanied by a diminution of starch reserves since the production of new shoots can occur at a faster rate than the bush can manufacture food materials for them. Under such conditions a clean prune is not practicable, but sufficient leaves should be retained on the pruned bush to produce the required supply of carbohydrates.

Selection

While the TRI has been successful in the selection of a number of outstanding clones both for yield and quality of tea leaf, the estates have not been slow in putting out a number of approved clones in recent years. We seek their further co-operation in the selection of even better mother bushes from the highly variable seedling tea which one sees in any estate.

Failure in V.P. is wrongly ascribed to lack of green fingers but to my mind good sense and sound horticultural principles are the "green fingers" that are spoken of so much.

ANSWERS TO QUESTIONS RAISED BY MR KEHL'S PAPER

Question:—Will tea seed soaked overnight in tea liquor or some hormone solution produce bushes which yield strong coloury liquoring teas just as Kathuru Murunga (*Sesbania grandiflora*) seeds soaked in cow milk before planting are reported in India to produce trees the leaves of which when cooked are sweeter than those from untreated seed? (Superintendent, Lantern Hill Group).

Answer:—It is most unlikely that seed treatment prior to germination will influence the quality of the tea produced by the bush. Similar claims of growth response by plants to music are reported to be unfounded, although pre-treatment of wheat seed with phosphates has had beneficial effect on germination and subsequent growth of plants.

Question:—Why under similar conditions cuttings of some clones root well and others do not. Even some clones callus to a size as big as $1\frac{1}{2}$" in diameter. (Superintendent, Lantern Hill Group).

Answer:—Ability to strike root readily is an inherent clonal characteristic, some clones being good and others poor rooters. Excessive callus formation is often due to poor drainage, and will retard rooting.

Question:—Has the Institute any information in regard to producing clones in Ceylon by controlled breeding designed to get something new and obviously superior to obtaining material by selecting pre-existing tea bushes, special reference being made to the correspondence in the Tea and Rubber Mail of December 20, 1963 under the heading "Tea seed and V.P."? (Manager, Duckwari Group).

Answer:—A comprehensive breeding programme was initiated at the Institute, with a view to producing new and superior clones only in May 1961 with the appointment of a post-graduate Scholar in Plant Breeding and Genetics. Experience at Tocklai where breeding work has been going on for several years indicates that with a highly heterozygous crop like tea quick results may not be possible.

Question:—What is the latest information the Tea Research Institute can give with regard to half-leaf cuttings in the nursery to develop V.P. cuttings against full-leaf cuttings? (Superintendent Pelawatte State Plantation).

Answer:—Half-leaf cuttings of clones with large leaves such as TRI 2023 strike root just as readily as full-leaf cuttings, and facilitate the maximum use of the nursery bed space.

Question:—In, say, a 30 acre field to be replanted on a 600 acre estate how many clones is it recommended should be used bearing in mind the diversity in character between clones. As a general policy for the future is it agreed that a policy of one clone for each field would be preferable? (Manager, Balangoda Group).

Answer:—Large scale planting of one or two clones is not advisable because of disease hazards and the so called clonal flavour of the made tea, and it is like having all the eggs in one basket. It is wise to have a reasonable number of clones on a minimum extent of five acres each, but with the present available data it is not possible to state precisely in what proportion they should be planted in order to maintain both high yield and quality.

Question:—If you had to replant, to which 6 clones of those tested and approved by the Tea Research Institute would you give priority for the mid-country? It may be assumed that drought and nematodes are not prevalent, but Blister Blight fairly severe. Quality and yield to be primary considerations. (Superintendent, Pitakande Group).

Answer:—Clonal field trials are in progress under different soil and climatic conditions in the mid country at the TRI sub-stations at Hantane and Passara where over 60 selected clones are under test. Many of these clones are also being grown for observation in private estates. Once the results become available it would be possible to give a precise answer. Meanwhile it would probably be quite safe to give priority to the high-yielding TRI clones 2024, 2025, and 2023 and the high-quality clone DT 1.

Question:—Is the growth of V.P. cuttings affected by the maturity of the mother bushes or by the length of time from pruning, or by the type of pruning of the mother bush from which the cuttings were taken? (Superintendent, Madulkelle Group).

Answer:—Cuttings taken towards the end of the year after pruning have a tendency to premature flowering, especially in the case of clones such as TRI 777 which are free flowering. The maturity of the mother bush should have no effect on the rooting of cuttings taken from it unless it is on the decline in vigour. The type of pruning should also have no effect on rooting if starch reserves are maintained by provision of adequate lungs.

Question:—Up to what length of time could a rooted V.P. cutting be allowed, to remain in a polythene basket in mid-county (Sabaragamuwa)? (Superintendent, Wallawe Estate).

Answer:—Not more than 8 to 9 months since the roots are likely to become pot bound.

Question:—Rooting hormone Seradix B is marketed in three grades *viz.* Seradix B 1, Seradix B 2 and Seradix B 3. Which of these would the Institute recommend for V.P. cuttings? (Asst. Superintendent Houpe Estate).

Answer:—In the Annual Report of the Plant Physiologist for the year 1957 (Bulletin No. 39) it is reported that all these commercial preparations of Seradix were used and only Seradix 3 showed some effect giving 42% rooting as compared with 30% for the control. It takes not more than 6 to 8 weeks to obtain 100% rooting with untreated cuttings of a good rooting clone, and it is doubtful whether growth substances, even if more effective, could be used in practice because of the large number of cuttings, over 7,000, required for 1 acre alone.