

TECHNICAL PAPER 4 – NURSERY MANAGEMENT

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Nursery infrastructure and management practices: The objective of Tea Nursery Management is to raise healthy, vibrant plants of uniform size of the appropriate cultivars [clones] with minimum casualties, properly trained and adequately hardened within a reasonably short time, eminently suitable for planting in the field. These objectives could be only achieved by proper advanced planning, paying sufficient attention to detail and by regular and careful supervision of all the relevant operations. Sadly out of the 05 estates the writer visited as VA in November 2016, only 02 estates had well tended tea nurseries; in the balance 03 large plantations either there were no nurseries or the only nursery was being closed down and plants sold to private growers out of that particular plantation!

SELECTION OF ‘MOTHER BUSHES’: The success of Vegetative Propagation [VP] depends on the selection of outstanding ‘Mother Bushes’ with the required attributes and characteristics which in turn would facilitate towards swift and easy means of propagation. In a Post-War ‘*White Jat*’ Seedling field it is generally accepted that around two-third of the yield of a field is produced by one third of the bushes; thus there is much potential available for selection of high yielding and disease resistant bushes; the writer calls it a reservoir of genetic talent!

The usual practice is to identify fields with around 40,000 bushes which have been collectively yielding higher than other fields; at first it should be based on visual estimation by rejecting bushes with undesirable characteristics after avoiding bushes located near drains, paths, vacant patches etc.

The following characteristics of bushes are to be rejected: [a] Inadequate bush spread with an upright habit; frames with poor spread and unhealthy foliage;

[b] Very short internodes; shoots with very short internodes are difficult to pluck and are less dense;

[c] Tendency to produce more ‘*banji*’ buds and those that flower early and more freely; such bushes that become dormant frequently and flower do so at expense of vegetative growth, are poor yielders;

[d] Having few maintenance leaves; such bushes would be weak due to low starch reserves, and

[e] Consequently recover too slowly after pruning.

Conversely the following characteristics are associated with tea bushes with yield potential: [a] Bushes with a high density of plucking points per unit area of the top surface are ‘candidates’ for selection’ as there is a strong correlation between plucking point density and high tea yield;

[b] Bushes with large leaves generally produce heavier plucking shoots, giving higher yields;

[c] Bushes with a natural spreading habit will support a wider plucking table – the economic base of a bush, with generally healthy and abundant maintenance foliage; [d] Long internodes are preferred as they are easier to pluck and intrinsically heavier;

[e] Swift to recover after pruning, showing robust growth compared with much of the rest!

STEPS TO SELECTION OF 'MOTHER BUSH'

Once bushes are picked based on visual inspection, they are subject to around 12 consecutive plucks and crop from each bush is carefully recorded to identify the potentially high yielders. This exercise will be followed with a preliminary test for quality using miniature processing machinery. Accordingly, the ones with appropriate quality characteristics are selected: for Up country, those with flavor and good liquoring character and for Low country, the ones with black Made Tea appearance.

Drought tolerant types should be selected from areas prone to drought; selection being done during height of the dry weather. Bushes which continue to yield plenty of flush during a drought would be expected to be more tolerant during dry weather conditions. Similarly, bushes tolerant to pests and diseases should be selected during heavy incidence of infestation of specific pest/disease.

Another vitally important factor is the early rooting ability of cuttings from the selected bushes. Those mother bushes whose cuttings fail or delay to root or which give a low rooting percentage under optimal nursery conditions should be discarded irrespective of other desirable characteristics as this is a basic need as it would be difficult to establish them in the tea nursery otherwise. To test the rooting ability, 100 cuttings from each selection should be laid out in the nursery along with an equal number of established 'fast rooter' such as a cultivar of TRI 2025, which would serve as a standard. [Source: TRI]

PRUNING OF MOTHER BUSHES: A suitable height for pruning mother bushes is about 35-40 cm [14-16 inch] in the Up-country and 40-45 [16-18 inches] in the Low Country. After the first harvest, the bushes could be given a cut across prune 15 cm [6 inch] above the pruning cut and a second batch of shoots could be obtained in 3-4 months time in the Up country. After this procedure, the bushes should be rested for at least eight months before pruning them again. Of course better and more vigorous cuttings could be obtained with a relatively longer period of resting. If cuttings are required each year, it is necessary to have two blocks of mother bushes. This will ensure that while cuttings are obtained from one block, the other block is rested so that it could be pruned the following year.

To obtain cuttings to plant a hectare, around 290 mother bushes are required [for an acre, about 120 mother bushes would be needed [Source: TRI] allowing 30 % as failures and weak plants. Accordingly one hectare of mother bushes are required for replanting 50 ha [one acre of mother bushes are required for replanting 50 acres] Pruning of Mother Bushes in the South-West Monsoon zone should be in November-December and in the North-East monsoon zone, during May-July.

MULTIPLICATION PLOTS: As multiplication plots would last for several years after establishment, it is vital that they are properly labeled so that cultivars could be easily identified. Plants of the same cultivar

should be planted carefully in separate blocks, which could be demarcated with a marker - dark pigmented cultivar like TRI 2043. Each block should have a label with the specific name of the cultivar and the date of planting. One should also draw up a field plan of the entire layout along with other details [number of plants per cultivar] and store the plan for safe-keeping in the estate office for reference of current or any future Managers of the plantation.

It is essential that plantations already have or intend having multiplication plots in the future need to pay particular attention to this aspect because in most instances, it is very difficult to identify the plants or the date of planting in established plots years after planting is completed.

Mother bushes should be spaced further apart than it is usually done, say 3ft x 5ft [not usual 2 x 4ft] for easy cultural operations, for better growth, for easy collection of cuttings and for ease of supervision. They should receive 'special treatment' such as being routinely sprayed for pests & diseases. Fertilizer application to mother bushes should be done regularly with T200 and T750 fertilizer mixture as unless the bushes are regularly fertilized and kept in vigorous condition, they are not likely to produce a large number of shoots. Obviously fertilizer applications should not be given within three months prior to or following pruning to avoid any possible scorch of developing foliage.

Two weeks prior to harvesting of cuttings, Foliar Spraying of 0.2 % solution of Zinc Sulphate [i.e. 8kg in 400 L of water] should be sprayed on mother bushes and it should be sprayed with knapsack sprayers.

SOURCES OF PLANTING MATERIAL

Having your own Multiplication Plots gives the best cuttings. ***Therefore every effort should be made to establish multiplication plots and to maintain them in a vigorous condition.***

FROM MATURE CLONAL TEA: Most estates obtain their cuttings from this source. However this mode is not the best as sections of a field could be generally on poorer soils, exposed to winds, inadequate fertilizer, foliar spraying etc. As a result obtaining cuttings from 'any field' is not the best option!

PURCHASE FROM OUTSIDE / CENTRAL NURSERIES: Very often when shoots are purchased from outside sources, the shoots are invariably over-matured in which the axillary shoots have overgrown even with floral buds. Once purchased estates have no other choice but to plant them out. Further, unless the shoots are well packed in wet gunny or in polythene bags with the basal ends of the shoots wrapped in wet cotton wool and the shoots wetted, they may start wilting and dying especially when transported over long distances; this factor alone is a strong point against the new trend of establishing so-called central nurseries – either to obtain planting material to a smaller estate nursery or to supply VP plants from a Central Nursery to a 'satellite' estate – invariably the 'smaller estate' suffers!

There is another unacceptable practice some growers adopt and that is: obtaining their cuttings from New Clearings, bushes rested from plucking, 'Tipping' fields etc. Such methods would only give poor cuttings and thereafter poor quality plants which in turn would result in poor Re-Planted Clearings! No wonder some people say that "Return on Investments on Re-Planting Tea is unviable"!!

Accordingly, every effort should be made to obtain suitable cuttings from proper sources. When it is unavoidable, a carefully chosen area of a mature cultivar tea field should be rested for around 6 months during which time two doses of T200 @ 60-90g [2-3 oz] to be given and thereafter, the bushes pruned in order to obtain cuttings.

SELECTION OF NURSERY SITE

Like in any successful business, planning is paramount: it is absolutely essential that one goes into all possible details before setting up a Tea Nursery, if your goal is final success in the field. Obviously, the size of the nursery will depend on the annual requirements of plants and the lie of land. A Rule of Thumb is that to have twice [or at least one and a half times] the actual requirements to make allowance for failures and early commencement of nursery operations for the following year.

As the nursery will be a permanent structure, much thought should go in deciding on location and also the following relevant factors which need to be taken into account:

[a] Closeness to a perennial source of clean water: The nursery should be close to a source of water from a stream, well etc., which does not dry up even during a drought! An overhead supply with pipe-borne water will be a boon as it could be used for sprinklers. It is essential that for any source of flowing water, it should be free from parasitic nematode which could otherwise spell doom for nursery plants!

[b] Effective Drainage: The nursery should be sited on flat or gently sloping well drained land and where relevant terraced with banks firmly held with a layer of stones. If water stagnates in the polythene sleeves, it could cause over callusing of the cuttings, leading to poor or shallow rooting and even death of the plants. Therefore one must avoid swampy low-lying areas where there is no movement of water.

[c] Location – obviously it is best that the proposed nursery be centrally located to facilitate easy supervision at any time; preferably it should not be sited in valleys, especially in the Up country where frost and low temperature could retard growth. A site exposed to morning sun would be ideal.

[d] Protection from winds – windy sites on peaks of hills should be avoided unless protected with ‘Wind Breaks’. Nursery plants exposed to strong winds do not anchor properly; leaves too get damaged.

[e] Proximity to source of planting material: As large quantities of soil are required periodically for propagation, it is preferable to locate the nursery fairly close to sites where good soil could be obtained towards reducing cost of transport. A nursery after all should be an asset and not a financial liability!

[f] Closeness to source of planting material: for successful propagation, the shoots from mother bushes should be brought to the nursery with minimum delay to avoid wilting which leads to poor performance of cuttings in the nursery. Ideally the nursery should be close to Multiplication Plots.

[g] Absence of shade trees: the nursery should not be located under shade trees with overhanging branches as during heavy rain the drip from branches could dislodge the cuttings in the beds and cause

damage to the roots. Also the incidence of Blister Blight tends to high under such conditions of high humidity and low light intensity. [Source: TRI]

PREPARATION OF BEDS

The nursery beds should be about 1.2 m [4ft] wide and of any appropriate length separated by paths for easy movement for operations and supervision. The preparation of beds consist of removing the soil to a depth of about 38 cm [15 inch] and a 5 to 7 cm [2 to 3 inch] layer of rubble and stones are placed at the bottom to improve drainage. The bed is then filled with the original soil, minus all stones and roots to a height of 15 to 23 cm [6 to 9 inch] above the path level. The nursery beds should preferably be in the North-South direction so as to receive sunlight over the entire bed.

The writer strongly advocates the establishment of a 'High Shade' structure of 1.8 to 2.1 m [6 to 7 ft] as apart from a relatively high cost it has a many significant advantages chiefly for ease of visual inspection, effective watering, fertilizing, easy re-stacking for uniformity of growth etc. The shade should be erected slightly sloping to receive much morning sun and also to prevent excessive drip during heavy rains. Coir matting is generally used as shade due to its many advantages such as longevity and toughness.

NURSERY SOIL

Soil structure is of great importance to the performance of cuttings – at times sadly overlooked! The relative proportions of sand / silt / clay determine the texture of the soil, preferably a loamy soil which has sufficient fine particles like clay and silt to hold up water, while at the same time well balanced with larger particles such as sand to allow excess to drain through. Loamy grass soils with plenty of fine feeder roots have proved to very successful as nursery soils. Clayey and coarse gravelly soils should be avoided for obvious reasons. To re-cap: Soil Structure refers to the arrangement of soil particles. Many failures in rooting are due to the use of soils with poor soil structure which inhibits drainage. [Ref TRI]

SOIL ACIDITY: Like for successful growing of tea, the pH is critical for nursery soil too. The preferable pH range is 4.5 to 5.5 but best results are obtained near pH of 5.0

TYPES OF SOIL: [a] Soils where Grass such as Guatemala / Mana have been planted for a year or two are associated with the best medium for rooting as they are better buffered and possess a good soil structure with 'stable crumbs'. They also have much un-decomposed grass roots that keep the soil friable ensuring adequate aeration and drainage. Of course large roots and stones should be removed by practical means such as sieving the soil thru a No. 4 mesh.

[b] 'Patna Soil': Soils in Patna areas on which Mana grass thrives naturally are as good as Guatemala grass as a rooting medium. These soils are extensively used by estates in the Uva region.

[c] Jungle Soil: Jungle soils are good rooting media provided excess organic matter such as leaves and twigs on the surface are removed from them before they are used for rooting of cuttings.

[d] Subsoil: Such soils are obtained from 90-180 cm [3-6 ft] below ground level and should be passed through a coarse sieve [No 4 mesh] to remove stones and gravels. Subsoil is generally free from harmful organism; the texture should be improved by incorporating sand and well rotted tea fluff or compost with a bit of sand [not excessive, as sand could raise the pH]

NB: From wherever the source of soil it should not be collected when it is too wet or too dry as the soil structure will be impaired. In the South-West zone, the soil should be collected in February/March and in the North-East zone in July/September – adjusted to suit the time of pruning of mother bushes and time of planting in the field – all such operations should be incorporated in a ‘Planting Calendar’.

POLYTHENE SLEEVES: The most convenient method of planting cuttings is in polythene sleeves filled with soil. The size of the polythene bag will depend mostly on the length of time the plants will be kept in the nursery. The standard size of bag for general use is 23 x 10 cm [9 x 4 inch] diameter filled with soil using 150gauge polythene. The bottom end of bag should be kept open with a few holes punched on the sides to facilitate drainage. Somewhat longer polythene sleeves 30 to 35 cm [12 to 14 inch] in length may be used to encourage a deeper root system. The dry weight of soil in a standard bag is around 1.3kg [3 lb]. Around 12.7 cubic m [450 cu ft] of soil is required to fill 6,000 standard polythene sleeves.

Instead of transparent polythene, for the preparation of polythene bags, some growers use ‘Black Polythene’ which is slightly more expensive. Though black polythene prevents moss formation of the bags in the peripheral rows, no difference in the growth of plants between black and transparent polythene has been recorded in trials undertaken by the TRI [Source: TRI]

When filling polythene sleeves with soil, a small layer of lightly wet soil should be gently pressed in at the bottom to make it hold onto the sleeve. This is followed by filling with handfuls of soils that is pressed [but not rammed in too hard] as to avoid formation of hard pans that would impede root development. The bags must be filled in uniformly all-round, up to the top of the sleeve, avoiding air pockets that would lead to sagging of the bag.

Obtaining sufficient quantities of suitable soil for nursery work has posed a problem for many plantations over time. Therefore finding of suitable material for partial or complete substitution of soil was looked at positively by the TRI and found that materials such as tea waste, coir dust [not from coastal areas] and paddy husk were found to be suitable for use with soil in tea nurseries, besides their nematicidal properties [TRI's Vitarana et al., 2002] these materials could be used as follows:

[a] Tea waste and soils in equal proportions could be arranged preferably in two layers with the soil layer being kept on top. [b] Coir dust in equal proportions with the soil can be arranged in two layers with the soil on top or it could be either mixed with the soil or used alone. [c] Paddy husk could be mixed with the soil in equal proportions.

NB: The tea waste and coir dust should be well decomposed [more than 6 and 2 months respectively] before use. However fresh paddy husk could be used; saw dust in same ratio could be used in Upcountry
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To enhance and broaden the scope of this paper, the writer is attaching relevant notes from a publication from none other than the Tea Research Institute of Sri Lanka [TRI] with illustrations where appropriate encompassing topics such as PROPOGATION with sub-headings: Time of Propagation, Type of Shoot, Type of Cutting, Planting of Cuttings, Propagation under Sealed Polythene Tents, Grafting, AFTERCARE: Shade & Watering; Fertilizer; Re-stacking, Hardening Off; Lateral Spreading, Pests & diseases, Use of Growth Hormones, & other Bio Stimulants, Schedule of Nursery Operations, References.