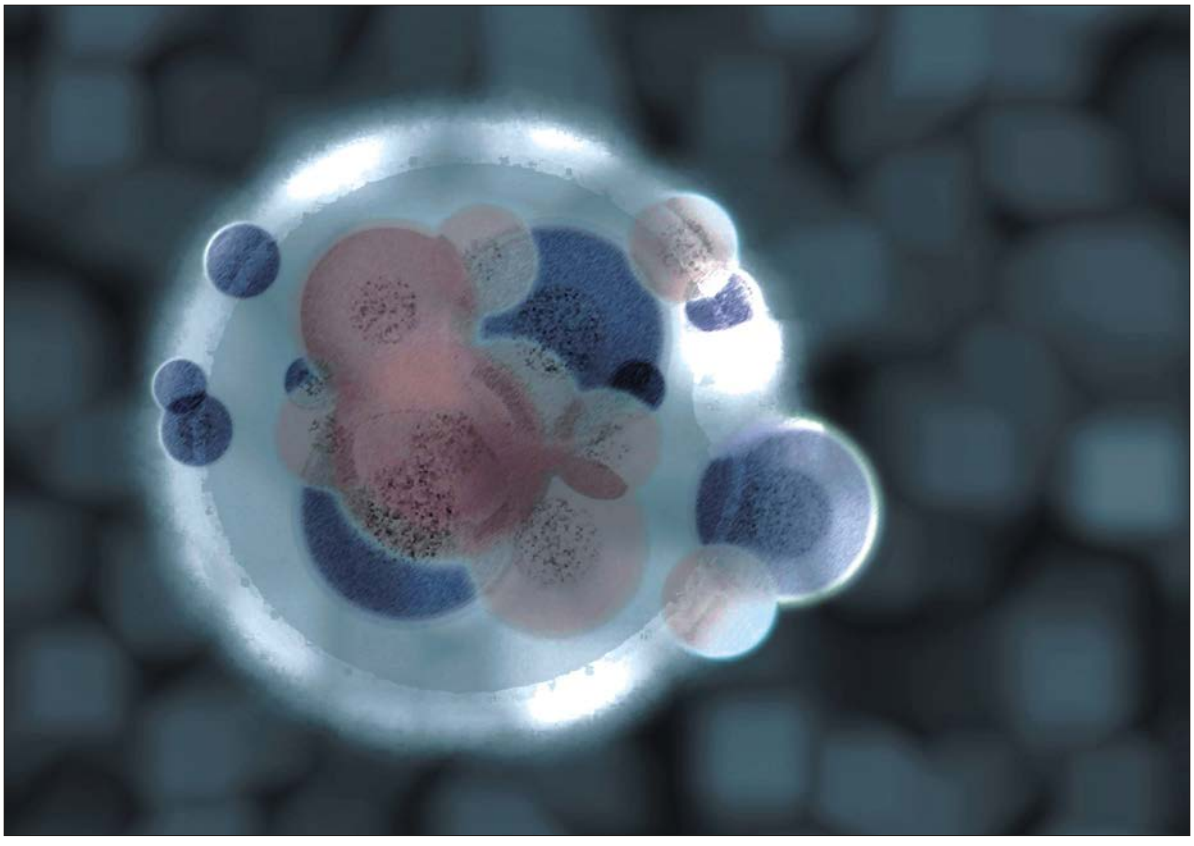

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# Criteria Used in Selection of Locally Best Tea Bushes

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**Abstract:** Study on the evaluation of some criteria used in selection of best bushes from NTRI tea garden i.e. selection of best tea bushes, grouping on the basis of initial pruned material and then used immediately to the same bush. The data recorded on bush canopy, plucking points, interval, rounds, yield and further determination by iodine and chloroform tests. Grouping was comprises on 5 categories from (A – E), i.e. 3 to 11 kg above of fresh pruned material. Though the population density was very low in group D and E (29 and 6 only) as indicated in Table 3, but these bushes were selected for further multiplication on the basis of average yield which was maximum in Groups D and E i.e. 3 to 3.5 kg as compare to group A, B, C.1.5 to 2.5kg/bush respectively. Table 3 reveal that amount of pruned material viz a viz (9 to 11 kgs and 11-above) not only increased the bush canopy (160 cm) as compare to Group A (135), Plucking Points (415 and 429) in Group D and E, where as in Groups A, B and C from (135 and 146) respectively. Plucking rounds (6) and interval (3 to 4 weeks) were the same in all the groups. Table 4 shows that Iodine test were also indicated Group (D, E) were rich in starch content, which are responsible for the shoot growth and obtain grades (4 and 6) where as other groups failed to obtained any grades. Table 5 were also resulted for chloroform test in same manner of pruned material i.e. 9 to 11 and 11 kg and above bushes have well in ability of fermentation in both the groups with the grades (2 to 4) and (4 to 2) in groups D&E as compared to others respectively.

**Key words:** Tea (*Camellia sinensis*), bushes, clone, selection criteria, evaluation, pruned material, bush canopy, yield parameters, iodine test, chloroform test

## Introduction

Tea (*Camellia sinensis* L.) belongs to family Theaceae was originally discovered in China, but due to its wide adaptability, it is grown under varying agro-ecological condition through out the world. Tea is a cash crop, which requires acidic soils and high rain fall for its economic production. Tea plant comprises on two types 1. Small leaf (*Camellia sinensis* L.) 2. Broad leaf (*Camellia assamica* L). Small leaved type is a slowly growing shrub with a number of stems from the ground and small hard erect leaves. This hardy plant is commercially grown in sub-tropical regions like Japan, Pakistan Turkey and Georgia. The crop harvest (top tender leaves) can be processed into black and green tea only (Rauf, 1994). The success of vegetative propagation as a means of producing material for commercial planting depends upon the selection of plants that are above average performance as regards vigiour of growth and manufacturable quality of leaf and on a technique of propagation that is capable of being organized on a large scale. A great deal of painstaking research work has been devoted in the larger interest of tea (*Camellia sinensis* L.) development with excellent results. Though the task of selecting mother bushes from which to propagate clones has an apparent simplicity, experience shows that the identification of exceptionally good material is by no means easy. Two factors are involved in the production of superior bushes" The genetical quality of the bush and environment in which it grows, including cultural treatments it has been received. These factors are completely confounded, what is required is a method of assing "the relative cash has made." In a large tea field it is easy to show by means of census of pluck able shoots that the greater part of yield comes from relatively small portion of the bushes. (Eden, 1976). Kehl (1950) found that only 5% of 1500 randomly selected bushed yielded results above the average and such bushes are easily detected by simple inspection. (Eden, 1976). Anonymous (1969) stated that a clone/mother bush selected in on district may grow poorly in another district or even in a neighboring area of the same district. Top working or grafting is the currently the most rapid, cost effective method of multiplying new clones, to utilize drought tolerance, high yielding by using conventional method through cuttings and establishing a field of source bushes for further multiplications (Nyirenda and Mphangwe, 1998). Tea can be propagated either by seed or by vegetative means. Two different plants are usually necessary to produce the seeds and consequently the progeny have mixture of the characters found in each parent, each individual resembling its parents to varying degrees. The progeny from seed is therefore highly variable both in appearance and in term of yield as well as in others characters. As reported by Kingdon-Ward (1950) that a major aspect in tea breeding programmes was the selection of promising plants from the existing population as a source of production of planting material.

Plants that are produced vegetatively from a single parent is called clone. Tea plant is self-sterile, highly cross-pollinated and heterogeneous in nature. For setting of viable seed, which cause considerable variation viz a viz morphological, physiological and agronomic traits in sexual progenies, which are seldom, resemble the parent's type. As reported by Seurei (1997) that tea *Camellia sinensis L.* improvement in Kenya has progressed in 3 phases. One of the steps was subsequent mass selection of clones using morphological/ phenotypic characteristics and needs to use the reliable selection criteria through breeding and different tests.

Seed basically propagates the existing bushes at NTRI, Shinkiari, so they don't resemble in characters to parent material due to variation. The entire garden is different in all characters like growth, yield, drought tolerance, vigour etc. Therefore the aim of the present study to evaluate some criteria for the selection of best bushes from the

existing tea gardens for further propagation and dissemination to the end users (tea growers) of the area.

## Materials and Methods

The present study was conducted at NTRI, Shinkiari from March 1999 to October 1999 on 13 years old Tea bushes of mixed seed population.

**Selection of bushes**: Fifteen hundred T-Bushes were selected phenotypically from 3 blocks (each of one acre). The selected bushes were tagged and pruned at the height of 60 cm above the ground level for collecting data and further selection process. The pruned material was weighted separately and put around the same bush. Out of 1500 selected, 750 tea bushes 50% were discarded due not meeting the desired level of selection criteria i.e. Producing < 3 kg of pruned material. The reaming 750 were tagged further for recording the data of different parameters (Table 2).

**Grouping**: All the 750 bushes were divided into 5 groups, based on weight of pruned material, to see the effect the pruned material applied to each bush and to identify the best yielder from the mixed population Applied fertilizer mixture (Ammonium sulphate, super phosphate and potassium sulphate) at 1050 kg/acre (provides 75 kg N, 15 kg P and 40 kg K) in April/May. The same dose was repeated in early July (Wickremasighe and Krishnapillai, 1986). The data recorded on the, no. of bushes producing 1.5, 2.0, 2.5,3.0.3.5 or above in the whole population accordingly (Table 1).

**Bush canopy**: Measuring of Bush circumference, 2 angles i.e. 4' x 2 = 8 / 2 =8.

**Plucking Points**: At the time of plucking counted each bush for plucking points.

**Plucking-Interval:** Observe plucking interval for each bush in due coarse of time of plucking through out the year.

**Plucking Rounds:** Observe the plucking rounds till its dormancy.

**Fresh harvest:** Green leave yield in kg for all year/bush.

**Chloroform test**: For the elimination of poor performer. The test ware carried in grass stopper tubes with small wad of cotton, adding 10 drops of chloroform and allowing stand for 5 minutes for complete saturation. The flush (bud + 2 leave) of all the new shoots on the bush was collected from the bush to be tested. These (bud + 2 leaves) are pinched off from the shoots and then placed in the tubes in normal room temp for 90 minutes. After the test observe the following:

A. Bushes turn to rich brown.
B. Bushes for intermediate colour (in between brown and green)
C. Bushes for full green colour.

**Iodine test:** Used for the determination of starch content. Selected branches were cut at 0.3 cm diameter in size at the height of 15 cm from ground and were tipped for 15 minutes. Finally determination of the starch content i.e. light dark means "low stanch level", dark colour means "high Starch level."

Table 1: Grouping of tea bushes

| Group | Initial weight of pruned material (kg) from individual bush In between one figure to the others |
|---|---|
| A | 3 – 5 |
| B | 5-7 |
| C | 7-9 |
| D | 9-11 |
| E | 11 & above |

Table 2: Schedule used for quick selection of best bushes

| Time frame | Stage | Selection criteria | Necessary activity |
|---|---|---|---|
| Early March | I | Start the selection process | Selected 1500 Tea bushes. |
| Mid March | II | Evaluate free growing vigourn of bushes. | Out of 1500 Tea bushes, which have above average branch in free growing stage were evaluated for further proceeding |
| Late March | III | Evaluate pruning weight (fresh) | Eliminate 750 bushes out of 1500. Which produced 3.00 kg of initial pruned material and then retain 750 only. |
| Early April | IV | Tagged for yield | The remaining 750, 250 from each block were tagged for further study. All 750 bushes were divided in 5 groups. (150 in each group). |
| Late April-Oct. | V | Evaluate yield of the selection. | The yield of 750 best performer were recorded. Selection retained at stage iv were continued at stage v for further experimentation. |

## Results and Discussion

A great deal of painstaking research has been done to achieve the objective. Results were encouraging though the task of selecting mother bushes from which to propagate clones has apparent advantages. But the identification of exceptionally good material is by no means easy.

**Effect of pruned material on various growth parameters:** The data in Table 3 showed that Yield of tea leaf is directly proportional to the pruned material applied to individual bush, its canopy and plucking points. Though the pruned material had no effect on the yield of tea. It suppresses the growth of weeds after decomposition provide organic matter/nutrient to the bush. The table reveals that out of 750-selected tea bushes of mix seed population 61% Tea Bushes are produced 1.5 kg of green tea leaves by coarse plucking. While 21% are produced 2.0 kg Fresh leaves. Where as 4% produced 3.0 kg and the reaming 1% was the prominent one among all the others producing more than 3.5 kg of green tea leaves. The Table 3 also shows that greater the amount of pruned material to the individual bush, more is the plucking points and bush canopy resulted

Table 3: Effect of pruned material on various growth parameters and yield of tea bushes

| Group | Wt. Of Pruned Material (Kg) | Bush Canopy (cm) | No. of Plucking points | Interval Between Plucking (weeks) | No. of Plucking round | Yield per Bush/ kg | No. of Bushes | Percent Population |
|---|---|---|---|---|---|---|---|---|
| A | 3-5 | 135 | 292 | 3-4 | 6 | 1.5 | 457 | 61 |
| B | 5-7 | 143 | 342 | " | 6 | 2.0 | 156 | 21 |
| C | 7-9 | 146 | 380 | " | 6 | 2.5 | 102 | 13 |
| D | 9-11 | 156 | 415 | " | 6 | 3.0 | 29 | 4 |
| E | 11 & above | 160 | 429 | " | 6 | 3.5 | 6 | 1 |

Table 4: Starch level of bushes as affected by pruned material, determined by Iodine Test

| Groups | Wt. of Pruned Material (Kg) | Results of Iodine test | | | | | | Total Grades | | | Final status |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | VL | L | D | |
| A | 3-5 | VI | VL | - | - | - | - | 2 | - | - | Poor/Rejected |
| B | 5-7 | VI | VL | L | L | L | L | 2 | 4 | - | Do |
| C | 7-9 | VI | L | L | L | L | L | 1 | 5 | - | Do |
| D | 9-11 | L | D | D | L | D | D | - | 2 | 4 | Good/selected |
| E | 11 & above | D | D | D | D | D | D | - | - | 6 | Excellent/selected |

VI stands for very light dark colour, L stands for intermediate dark colour, D stand for rich dark colour

Table 5: Fermentation percentage in leaves as affected by pruned material determined chloroform test

| Groups | Wt. of Pruned Material (Kg) | Results of Chloroform test | | | | | | Total Grades | | | Results |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | A | B | C | |
| A | 3-5 | C | - | - | - | - | - | - | - | 1 | Rejected |
| B | 5-7 | C | C | C | C | A | A | 2 | - | 4 | Do |
| C | 7-9 | C | C | B | A | C | C | 1 | 1 | 4 | Do |
| D | 9-11 | B | B | A | B | A | B | 2 | 4 | - | Selected |
| E | 11 & above | B | A | A | B | A | A | 4 | 2 | - | Selected |

A for rich brown, B for in between for brown and green, C for still green very light brown colour

in more yield i.e. by providing greater amount of pruned material (11 kg or above), bushes of group (E) produced highest plucking points of 429 and bush canopy 160 cm, which resulted in maximum yield of 3.5 kg. But in group A, 3.5 kg of pruned material is provided to the bush, which produced less plucking points 292 and bush canopy 135 cm and resulted in less yield i.e. 1.5 kg/bush.

**Starch level:** Table 4 shows that very little amount of starch is present in some selected bushes in-group A, B and C. Only two bushes shows very light dark colour while the others 4 shows no sign of any coloration in Group A. So the group A was rejected on the basis of colouration. Group B resulted in very poor only 2 bushes shows very light dark colour while the other 4 bushes shows intermediate dark colour which was also rejected due not fulfill the selection requirements. Similarly group C was resulted in only 01 bush show very light dark colour and others 5 bushes shows intermediate dark colour, was also rejected due not fulfill the selection requirements. Where as group D and E shows the satisfactory result. In group D, 2 bushes show intermediate dark colour and other 4 shows rich dark colour whereas group E shows excellent performance among all others bushes shows rich dark colours. Both of these groups' shows highly significant in starch content as well. Thus it is quite clear from the result that the amount of pruned material from 9 to 11 and 11 and above kgs increased bush canopy, plucking points and yield with starch content of the bush.

**Fermentation percentage in leaves:** Data on %age shows that once again Group D and E were the most prominent among all others as tested with chloroform test solution. In group A, only one gave very light dark brown colour while other 5 shows no sign of colouration and by virtue of their poor performance these were rejected. In-group B four bushes just like A while others 2 shows rich brown colour that was also rejected. Similarly in group C 4 bushes shows once again the colour just like in group A and B (i.e. very light brown) while one show intermediate brown colour and one shows rich brown colour this group was rejected due to poor colouration for fermentation percentage. In-group D, 4 bushes show intermediate brown sign and 2 rich brown where as group E obtained good results 2 for intermediate brown and 4 for rich brown colours. As it was evident from the results of Table 3 that high level of pruned material has good effect on bush canopy, plucking points and fresh yield, as well as fermentation of leaves. Table 5 resulted for chloroform test in tea leaves were also gave good results with same level of pruned material.

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