

EXPERIENCES OVERSEAS ON REPLANTING WITH HIGH YIELDING MATERIAL

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I have recently had the privilege of visiting for a short period 3 different regions where tea is cultivated on a large scale, namely, Georgia in the U.S.S.R., Assam in North India and Anaimallais and Nilgiris in South India, for the purpose of studying the present position in regard to V.P. and plant breeding. I propose briefly to survey the observations made in regard to these subjects at this symposium.

Georgia, U.S.S.R.

The main tea plantations in the Soviet Union are located in Georgia where the climate is sub-tropical, but extremes of temperature prevail. The rainfall is about 90 inches and well distributed. The plantations vary in elevation from 100 to 1,500 feet.

Propagation of high-yielding quality teas in Soviet Russia is entirely from selected seed. Organised work on tea breeding was initiated about 1926. As a result of generous financial aid the Russians are forging ahead of other tea-growing countries in breeding work. Their preliminary trials indicated that continuous in-breeding has a deleterious effect on germination and growth, while out-breeding or hybridisation often results in offspring of considerable vigour. Moreover, they maintain that the high yielding and vigorous qualities shown by cultivated tea are due to their hybrid nature. Such plants are very heterozygous and contain many favourable genetic factors.

In their breeding work at the Chakwa Experimental Station in Georgia, all desirable characters of yield and vigour are being investigated. Special importance is attached to winter hardiness. The achievement of such a breeding objective permits tea to be grown in regions where the crop could not previously be grown. Breeders in Russia are very fortunate in that there are hardly any diseases and pests to contend with. Poria, blister blight, parasitic eelworms and shot-hole borer are unknown and most of the injurious mites found in Ceylon are of minor importance.

Breeding is a large and complex subject and I will confine myself to a few general principles. The first step in any scheme of breeding is selection which involves choosing the best bushes of those already existing, and hybridisation among these with the object of creating new genetic combinations. The factors for which selection work at Chakwa is made and the procedure adopted is as follows:—

1. **Yield.**—Promising bushes in State and Collective Farms are chosen for observation and individual records maintained.

2. **Quality.**—Leaf from each individual bush is chemically analysed for its polyphenol content but the final selection is made on the basis of tasters' opinion. Pubescence of the bud is thought to be an index to quality, but the All-Union Scientific Tea Research Institute in Maharadze, Georgia, has so far not obtained a correlation between hairiness and quality.

Frost resistance.—Bushes are selected on the following characteristics:—

- (a) Those that have a tendency to produce red or woody shoots.
- (b) Flat leaf types and not V shaped jats.
- (c) Dark leaf jats.
- (d) In regard to displacement or position of leaves on branches, oblique types rather than horizontal.

The selected bushes are allowed to grow as seedbearers. When seeds are formed they are collected and are grouped or classified according to the morphological features of the flowers and leaves of the parent bearers. Each group or form is grown in a separate row, and at flowering the bearers are hand-pollinated with pollen of the same group.

Every generation is examined closely, only those strains that display most of the desired characteristics being kept for further testing. For instance, in the progeny of the first generation as much as 80 per cent. of the hybrids are discarded. From the second generation onwards about 20 per cent. of the progeny is rejected. Four such generations have passed a very close scrutiny by a number of examining commissions and 7 lines have been eventually selected. These are said to produce plants that would yield about 30 to 40 per cent. more than commercial seed. The progeny of 3 Chinese hybrid types have shown greater winter hardiness than unselected seed, and are mainly used for planting in Northern regions where the temperature during winter is about 14°F. No large areas have, however, been planted with these approved types so that it is not possible to make any comments on their behaviour.

It has taken over 30 years to find 7 suitable varieties which is undoubtedly a long period but it must be realised that the usual time required for one generation, including yield and quality testing is about 7-9 years. Furthermore it is not often appreciated that certain bearers are unlikely to produce sufficient seed for the next generation even after 5 to 6 years.

Vegetative propagation was started in 1928 but much progress has not been made. At the All-Union Scientific Tea Research Institute we were informed that success in the nursery was about 70 per cent. and in the field almost 100 per cent., but no large scale planting has been undertaken as propagation by seed was considered more economical than V.P.

The clones tested by the Research Institute are more vigorous than seedlings, though in the first year of plucking the clones gave lower yields than the seedlings. This is probably due to the system of planting 4 to 5 seed per hole, but from the second year onwards clones have proved to be superior.

Assam

The tea gardens of Assam have in the past shown a preference to seed as high quality seed is readily obtainable. The commercial seed baries have for many years been ruthless in the removal of "rogues" and selected seedlings are used as replacements, with the result that they have developed strains of remarkable uniformity producing high yields and good quality teas.

This situation has brought about the routine replanting which is a feature throughout the Brahamaputra Valley. For the last ten years even tea yielding as much as 1,200 lb. has sometimes been uprooted and replaced with available improved

varieties: For instance, an estate of 400 acres extent obtains an average yield of over 1,850 lb. The best fields totalling 90 acres gave over 2,000 lb. per acre and the crop harvested from the lowest yielding field was 1,600 lb. This estate is uprooting tea and has in the past 3 years replanted 30 acres.

V.P. work was started about 20 years ago but it has only recently gathered a tremendous impetus, which is evident from the demand for material of the eight approved Tocklai clones some of which are yielding twice as much as that of seedlings.

The total area under V.P. is probably about 400 acres most of which is an old tea land. One Company which has a special officer in charge of their propagation work has made considerable progress. This Company has over 100 acres re-planted with 5 clones which are, however, not yet in plucking. One of their best clones has given over 3,200 lb. in a test plot. Incidentally there are other Companies which employ specialists for making selections, carrying out the propagation and maintenance of nurseries. Those estates have realised that a Manager or Superintendent has neither the time, nor the facilities for carrying out thorough trials of all selected clones under a variety of conditions and over a period of years.

The selective breeding of tea was started at The Tocklai Experimental Station about 1940. Although this work has not yet resulted in the production of high yielding types of high quality, it is anticipated that outstanding seed will be made available to estates in about 8 to 10 years.

Breeding work is carried out by the following methods:—

1. *Mass Selection*.—Seed of any good commercial jat are sown in a nursery and about 1 in 1,000 to 2,000 plants are selected for vigour, pubescence, and other desirable characteristics, as the future bearers. This method is not the ideal and is regarded as a temporary expedient; the progeny of such bearers will often be better than the best commercial seed that is available at the moment.

2. *Polyclonal Selection*.—Polyclonal seed gardens are established with about 8 to 10 desirable clones propagated vegetatively. Under the right conditions this method can produce satisfactory results with fair rapidity. If the first generation seeds give the desired plants, then a full scale seed garden is laid out. This method is tried by more than one seed garden.

3. *Pedigree or Bi-clonal Selection*.—Selected pairs, propagated vegetatively are mated artificially. Many of the disadvantages of mass selection are minimised in bi-clonal or pedigree selection. Tocklai has made numerous matings in the past twenty years and there is the possibility of obtaining definite results by about 1965.

No rehabilitation is often undertaken prior to replanting, though Tocklai has recommended that a green cover crop like *Crotalaria anagyroides* be grown for a period of one year or preferably two years. Where, however, the yield has been lower than 750 lb. per acre, the period of reconditioning advised is 3 years. The green crop is ploughed in about a month or two before the planting of tea.

South India

The total area replanted with V.P. in South India would probably be about 300 acres, mainly in the wet zone. Hardly any estate, subject to droughts use V.P. plants, but one estate that was visited has been very successful with clones. This estate which is subject to dry spells extending for 4-6 months has one outstanding clone that has proved to be far superior to seedlings which were a complete

failure; the casualties of the clones were almost nil. Approximately 100 acres on this estate are in V.P., 70 acres in new clearings, and the balance in numerous small blocks in the old tea. The results obtained only clearly indicate that clones can be grown in drought areas provided the right types are selected.

An estate at over 6,500 ft. elevation is making rapid progress in V.P. work. About 10 local clones are being propagated on a large scale. The growth made by the better clones in 5 to 6 years was reported to be equivalent to that of 10 to 12 year old seedlings.

Estates in the high range of South India use clones exclusively for infillings. Like in Assam specialists are sometimes employed for this work.

No large scale *replanting* is undertaken in South India but small uneconomical areas are uprooted and replanted with V.P. plants. The method of rehabilitation, where this is done, is similar to that of Assam.

General

As regards V.P. work, I think we are probably more advanced than Assam, South India or Georgia. We are in a position today to show our friends from Tocklai and U.P.A.S.I. excellent clonal fields in different parts of the island. The only difference between our replanting scheme and that of Assam is that we have not yet reached the stage where tea yielding as much as 1,200 lb. is uprooted and replaced.

India as well as other countries are steadily progressing with their tea production, and it must be emphasised that if we are to compete with other countries it is very essential that we should meet this competition with the production of high yielding tea of the highest quality.

Before ending I would like to quote the words of a notice that was prominently displayed in one of the Pavilions of the Moscow Exhibition:

"Consider well the figures and results shown, and study the means by which they have been obtained. But do not regard these merely as a prescription, as a universal remedy, or immutable doctrine. Only on the basis of your work and efforts and continued research is it possible to find the correct methods for every individual case."