PHYSIOLOGY OF GROWTH AND DEVELOPMENT OF CLONAL TEA (*CAMELLIA SINENSIS* (L.) O.KUNTZE) AT LOW ELEVATIONS IN SRI LANKA

By

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ABSTRACT

The prime objective of this study was to investigate the growth of different tea clones in relation to environmental factors, crop physiology and management practices under low elevation growing conditions in Sri Lanka with a view to improve growth habit to realize maximum yield.

An analysis of weather using daily weather data of 20 years was made possible to predict the most probable dates for the commencement of rain and dry periods and also their lengths. During dry months, there is a very high probability of soil moisture falling below the permanent wilting point and to increase the daily temperature to a very high level causing severe stress on plant growth.

Clone TRI 2023 showed overall better growth followed by clone TRI 2026, 2025 and S 106 in the nursery. The predicted values of growth analysis parameters using curve fitting approach revealed that better growth performance of clone TRI 2023 was due to relatively high RGR, NAR and LAD.

Fifty percent shade in the nursery gave best growth, suggesting that the present method of providing 75% shade using coir matting may retard the growth. The ideal mother leaf in a shoot carrying 12 leaves for propagation was the 5th leaf from the apex.

The unit leaf dry weight of mother leaves gradually increased and then declined towards the 20th

week after planting, suggesting that mother leaves actively photosynthesise, store and nourish the growing plant until they cease to perform a useful role by about the 20th week.

A detailed study on growth and development of four tea clones, TRI 2023, 2025, 2026 and DN was made from field planting upto about 2 years in plucking. Clone TRI 2025 showed better early growth resulting in dense canopy. Although TRI 2023 was the highest yielder, it was not the highest dry matter producer. High yield of clone TRI 2023 was mainly due to better dry matter partitioning resulting greater harvest index, bigger harvest units and more active buds. Growth analysis parameters were successfully predicted upto 2 years in plucking using curve fitting approach. Although LAI and LAD was low in clone TRI 2023, better yield compared to other clones was due to high RGR and NAR. Very high bio-mass production of free growing plants was due to large canopy and root system. High NAR of these plants may suggest better light interception.

A similar study was carried out on new growth of mature tea of clone TRI 2023 after pruning. The soil moisture at 6 weeks from pruning and at 20 - 30 cm layer is critical for production and survival of sprouts after pruning. Resting prior to pruning is advantageous for the production of healthier frame with thicker branches. A detailed study on individual shoots

show that, it takes about 33 days to produce a unit of bud and one leaf and thereafter 4 - 5 days to produce an additional leaf. Yield can be significantly increased by plucking bigger units at shorter intervals.

The system developed to measure net photosynthesis rate [NPR] of detached leaves was found to be very successful and convenient. The NPR gradually increased with leaf maturity, reaching maximum when shoot above is ready for harvesting. From then on to about 24 weeks, the mother leaf plays an active role as a source of dry matter production. High NPR of clone TRI 2023 also can be attributed to high yield of this clone.

Contribution to dry matter production by mature leaves lower down in the canopy is very low due to low NPR and shading. The effective leaf area under present bush management level is about 42% of the total leaf area, which has the potential of yielding about 4800 kg/ha/yr. By adopting high tipping, it was possible to produce large canopies with thicker branches, resulting in high yield in subsequent cycles. When hard plucking was combined with high tipping, it was possible to increase the yield significantly and to reduce the plucking height.

Similar results were obtained by forming the bush canopy into a "Tower" at tipping. The plucking surface area continued to increase in "Tower" plucking, whereas it was restricted at 21 months in estate

plucking. "Tower" plucking consistently resulted in higher yield and this may be due to larger plucking surface and more light interception by canopy leaves.