Environmental Factors that Influence Rubber Plantation

By
MR. A. K. KRISHNA KUMAR
The Rubber Board, Agarthala
(TRIPURA)

INTRODUCTION

The Rubber Tree (*Hevea brasiliensis*) is a native of the Amazon rain forest, the native habitat being, 5° latitude on within either side of the equator. Early commercial plantations of this crop thus were established within this geographical position, mostly in south east asia. The *Hevea* tree however is far more adaptable to a wide ranging agro adaptable to a wide ranging agro climatic situation and the plantations have spread to the extend up to 29° North latitude in China, Burma and India and to 23° South latitude in Brazil. Not-with-standing its wide adaptability, the *Hevea* tree has agro climatic preferences and the optimum environmental requirements can be summarised as follows :

1) Rain fall range of 2000-4000 mm per year, evenly spread, and about 100 to 150 *rainy days per annum.*
2) A temperature range of 21 to 35°C.
3) A humidity of 80%.
4) Sun shine amounting to about 2000 hours @ 6 hours per day.
5) Wind speed upto 1 metre per second. The rubber tree can stand upto wind flow of 17.2 metres per second with damages of varying degrees and wind speed as per Beaufort scale morethan 10 will result in extensive damages.
6) Soil. The crop will sustain on majority of soils of humid tropics. The crop can withstand wide range of PH (3 to 8) but the best performance lies in the range of 4 to 6.5 Nutrient deficiencies though do occur can be corrected by application of fertilizers.

EFFECT OF CLIMATE ON GROWTH OF HEVEA

RAIN FALL

Rubber is basically grown under rain fed condition (irrigation is practised only in nurseries commercially). Studies on water requirement and water balance for rubber has indicated that a rain fall of 125 mm per month is the minimum requirement for the growth of Hevea. The water requirement of rubber tree depends on the rain water reaching the ground, evaporation, transpiration and loss of water through various other source. Most of the traditional rubber growing regions have a rain fall range of 2000 to 4000 m. m. The influence of the other factors such as cloudiness, length of day also affects the growth of rubber. Rain fall affects the soil moisture which inturn affects the production of rubber as the number of rainy days has a bearing on the number of tapping days. Rain of high intensity of 9 to 11 m. m. per day will hamper harvesting operations. A rain fall of morethan 150

rainy days will result loss on tapping days. Soil moisture stress has been proved to have direct influence on the yield of latex besides influencing other aspects such as root system shoot/root ratio, etc. Higher rain fall shorten the sunshine duration. Because of higher input of raditation energy there is a potential for higher dry matter production at latitude away from the equator.

Loss of soil has been reported due to heavy rain fall which can be minimised by dratically by following methods such as growing of legume ground cover crops which is a mandatory plantation management practice.

The *Hevea* tree is reported to have a relative transpiration rate varying from 0.11 during dry period to 1.13 during the peak production period. The mean water requirement of the rubber tree has been found to vary from 10 litres per day per. tree from the first year to 100 litres per day for a mature tree. In the tree has been found to with stand annual water deficit of the order of 200 to 350 m. m indicating the adaptability of plant in the dry conditions. The type of soil has also as a bearing on the moisture stress on the trees.

TEMPERATURE

Hevea through has a wide adaptability extreme temperatures affect the growth and performance of trees. A temperature range of 21 to 35° can be regarded as suitable for rubber. A temperature range of 21 to 35° can be regarded as suitable for rubber. Higher temperatures has been observed to cause injury to the leaf. Rubber tree has been found to require irrigation during extreme temperature situation and thermal injury has also been observed in such situations the effect of which can be minimised by contact shading of leaves and stems. Cultivars vary in their tolerance capacity to temperature. Wide fluctuations in temperature within one day affect the rubber trees. The low temperature injury depends on the duration of the low temperature rather the low temperature itself. Proper agro technologies to avoid stragnation of cold air by increasing inter row spacing, adopting low tapping frequency and shallow tapping have found to meet with success in mitigating the stress effects.

RELATIVE HUMIDITY

Evapo-transpiration is influenced by relative humidity which turn influences the transpiration rate of the plants. Humidity has been reported as having a direct bearing on the yield of latex. Lower humidity result in higher evaporation and transpiration which directly affects the soil moisture and also affects and turgor pressure of the trees.

ALTITUDE

Altitudes also has influence on the growth of rubber trees. An altitude of more 450 metres adversely influence the growth of *Hevea*. In altitudes higher than 200 metres a delay in growth has been reported resulting in delayed maturity.

SUNSHINE

Duration of sunshine has been recorded to have a negative effect on photosynthesis and on growth under moisture stress conditions. An increase in sunshine duration has been associated in an increase in latex production. Low latex production during cloudy days can be attributed sunshine hours.

WIND

Majority of the rubber growing tracts have a mean velocity of 1 to 3 metres per second. Higher wind velocity cause damage of different forms such as branch snaps, uprooting etc. Higher wind velocity of morethan 2 metres per second require wind barriers. Deformation of

the canopies and canopy structure has been reported to the effected by higher wind velocities.

PHYSIOGRAPHIC FEATURES

SLOPE

The extent of slope determines the infiltration of water run off and also the extent of soil erosion. A gentle slope (5° to 15°) can be regarded, as ideal for rubber plantations. However, rubber has been observed to be grown in much steeper slopes. Slope has been reported to have a direct influence on the growth and performance of *Hevea*. A slope upto 26% was reported to favourably influence growth of rubber tree.

ASPECT

Studies in rubber plantation in China have revealed that rubber trees on Leeward slope suffered less damage due to cold. Rubber trees in south and west slopes have been reported to suffer less cold damages in China. Stagnant water in root zone has been found to reduce cold hardness of rubber tress. In North East India the growth or rubber was found to be better in southern slopes at an altitude of 600 mtrs. which is in contrast to the traditional rubber growing region.

DEPTH OF SOIL

Soil depth is an important parameter influencing the growth and yield of rubber. For better anchorage and for a good moisture supply a good depth is essential. A depth of morethan 125 cm. has been reported to increase growth, yield and also leaf nutrient content.

SOIL

Hevea brasiliensis has been reported to thrive in a wide range of soils of varying physical, chemical and physio-chemical attributes. Physical properties in general are considered more important in assessing the merits of the soil. Soils of medium texture are considered best suitable for rubber. Clay content has been reported to have effect on growth as well as yield. Feeder root development also is effected by the texture and a positive correlation of root development with sand and inverse correlation with the clay has also been reported. Soil moisture retention characters also influence the growth and yield of rubber. (The rubber plantation itself in general has been reported to improve the soil physical properties of the denuded forest areas also).

Hevea tree grows in soils of wide range of pH (3.8 to 8) However, a pH range of 4 to 6.5 has been regarded as the best pH range for rubber. Soils in rubber growing countries have been found to be low in exchangeable bases. High amount of aluminium ion concentration is also encountered in most of these soils. Nevertheless the tree itself is adaptable to a certain amount of aluminium concentration and low base saturation Plantation management practices like growth of leguminous cover crop, enrichment of organic matter and addition of rock phosphate moderate the deleterious effect of aluminium concentration. *Hevea* respond well to fertilizer application and critical levels of soil available nutrients have already been furnished in the previous note on fertilizer application.

The rubber growing soils in India have been classified mostly under the order Alfisols and Ultisoils, as per the International system of classification.