Genotype×Environment Interaction for Yield of Modern Hevea *Clones in India*

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In India, traditionally rubber is cultivated in the southern states of Kerala and Tamil Nadu. The paucity of land for further expansion of area in rubber cultivation in the traditional belt, and increasing demand for NR in the country necessitated extension of cultivation to non traditional areas experiencing specific, often adverse, climatic situations. A high yielding clone in the traditional region may not perform equally well in the non traditional areas. This differential response of different clones in different environments which is referred to as Genotype x Environmental Interaction (GEI) forms the subject of the present study. Large scale multi environmental trails (MET) were established in 5 diverse locations across India in the year 1996 with dual objectives viz., (a) To determine the effect of GEI on the dry rubber yield of modern Hevea *clones and (b) To identify stable and adapted clones to diverse agro ecological conditions in India. The study is the first of its kind on modern clones including the newly evolved RRII 400 series.*

A total of 12 promising clones were evaluated in the five diverse locations viz., Kanyakumari (08° 26'N; 77° 36'E) in Tamil Nadu and Padiyoor (11°58'N; 75°36'E) in North Kerala in the traditional region and Agartala (23° 53'N; 91° 15'E) in Tripura, Nagrakata (28° 54'N; 88° 25'E) in W. Bengal and Bhubaneswar (21° 15'N; 85° 15'E) in Orissa in the non traditional regions. Among these, tapping could be initiated simultaneously in three locations viz., Kanyakumari, Agartala and Nagrakata in 2003. In Padiyoor tapping was delayed until 2006 due to poor growth of all the clones in general. In Bhubaneswar, the trial was badly affected in the early phase by a super cyclone and tapping could be initiated only in 2009. The present paper reports the yield performance of a set of Hevea *clones for the 4th, 5th and 6th year of tapping (2006-2008 period) across the above three locations with a view to identifying stable as well as locations specific clones.*

The AMMI model (Additive Main Effects and Multiplicative Interaction) is an effective and useful tool to study GEI and to diagnose the interaction patterns graphically. AMMI analysis of yield was tested for ten clones in 3 locations over a period of 6 years of tapping. The analysis revealed that, 36.6 % of the total variation was contributed by the environment (E) and 36.4 % was contributed by Genotype Environment Interaction (GEI), indicating large differences in environmental means as well as GEI means contributing to a major proportion of the variations in rubber yield. Twenty seven percent of the total variation was attributed to genotypes.

Genotype means ranged from 35.31 to 56.24 g/t/t. Clones RRII 429, RRII 422, RRII 417, RRII 430 and RRII 105 were the high yielding ones across environments. Among these RRII 105 and

RRII 430 had almost similar means but their interaction pattern was different. RRIM 600 which showed the least interaction was found to be the clone with wide adaptability. RRII 429 though a high yielding clone in the non traditional region was found to be the least stable as indicated by the largest absolute IPCA (Interaction Principle Component Axis) score.

Among the locations tested, Kanyakumari and Nagrakata were the sites with the top yielding environments. The interaction pattern of Kanyakumari showed greater environmental variation between years indicating that this location will differentiate the clones better. Analysis of GEI from AMMI-2 biplot showed that among the high yielders, RRII 105 and RRII 430 were best suited for Kanyakumari region whereas RRII 429, RRII 422 and RRII 417 were more suited to the non traditional areas.

The study, involving the RRII 400 series and other promising selections has revealed the extend of G x E interaction for rubber yield and has led to the identification of the high yielding clone RRII 430, to be a stable clone. RRII 430 and RRII 414 along with RRII 105 were identified to be more suited for cultivation in the traditional region of South West India while RRII 429, RRII 417 and RRII 422 were the clones identified to be more suited to the non-traditional tract of NE India.

Key words: rubber tree, yield, G×E interaction.

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[2]Hevea Breeding Sub Station, Kanyakumari.

[3]Regional Research Station, Agartala.

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[5]Rubber Board, Kottayam.

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