



FINAL REPORT

PROGRAM IN SCIENCE AND TECHNOLOGY COOPERATION (PSTC)

PROPOSAL 6.400

"BIOTECHNOLOGY APPLICATION FOR CHARACTERIZATION  
AND SELECTION OF BETTER-YIELDING RUBBER CLONES"

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## ABSTRACT

Biochemical parameters for rubber yield evaluation in *Hevea brasiliensis* were investigated. Diurnal variations of rubber biosynthetic enzymes and rubber contents indicated the important role of HMG CoA reductase (HMGR) as regulatory enzyme parameter. Correlation between HMGR and rubber contents was investigated in both latex and leaf studies and found to be highly positive. Intraclonal and interclonal correlation studies also indicated highly significant positive correlation. These results pointed out important role and practical use of HMGR as a biochemical parameter/marker for rubber yield evaluation.

The positive correlation between HMGR level and rubber yield was studied and also found at seedling stage. The influence of rootstock on the enzyme level and rubber yield was observed and characterized in the young seedlings. The findings indicated the potential use and application of HMGR as enzyme marker for early selection of potentially high-yielding clone. The potential high yielders could be screened and selected from either a single clone seedlings or grafted seedlings population. Mass screening of 536 Brazilian clones using HMGR parameter resulted in the identification of ten high-yielding clones which were more superior to the current high yielder (RRIM 600).

The enzyme HMGR was purified to homogeneity and characterized as in the published report (17). Basic study on biochemical regulation of HMGR was also carried out and the results was published (21). Development of ELISA for HMGR was attempted but the antibody titer was not high enough to be of practical use at the moment. Calmodulin in the latex C-serum was also found to be positively correlated to rubber yield (21) and could prove to be of practical use in the near future.

Preliminary study on disease resistance screening of *Hevea* at tissue culture stage was investigated. Callus could be initiated from male flowers as well as inner seed integument of several *Hevea* clonal types. Bioassay of leaf and cullus infected with live pathogen (*Phytophthora botryosa*) indicated GT-1 to be of the resistant clone. RRIM 600 was found susceptible to *Phytophthora* while GT-1 was much more resistant to the pathogen. Further study is being carried out in the subsequent investigation.

## IMPACT

The HMGR marker has high potential application to selection of high yielding grafted seedlings and mass screening for the high yielders at early (seedling) stage. It is, however, needed to be proved at a plantation level. Recently, the Bangkok Rubber Land & Engineering Co. Ltd. agreed to grant us financial support and land facility for the long-term follow up at a plantation scale. It is hoped that in the near future we can produce certified high-yielding grafted seedlings for distribution among 800,000 small rubber farmers in Thailand and the nearby rubber growing countries.

## KEYWORDS

Rubber (*Hevea brasiliensis*), Rubber yield, Enzyme marker, HMG CoA Reductase, Calmodulin, *Phytophthora botryosa*