

Potential, Progress and Future Thrust Areas of Coffee Biotechnology Research in India

H. L. SREENATH¹, R. NAIDU²

¹Biotechnology Centre, Unit of Central Coffee Research Institute, Coffee Board,
Manasagangothri, Mysore - 570 006

²Central Coffee Research Institute, Coffee Research Station, 577 117, Chikmagalur District

SUMMARY

Intensive research efforts of Central Coffee Research Institute (CCRI) during the past seven decades have resulted in sustained increase in production and productivity of Indian coffee. But still there are many old as well as new challenges to be overcome to make the Indian coffee cultivation sustainable in the next millennium. Biotechnology can make significant contributions in overcoming these challenges. In India, coffee biotechnology research activities, almost exclusively concentrated at CCRI, are focussed. On micropropagation, anther culture, embryo rescue, endosperm culture, protoplast culture, genetic transformation, marker aided selection and *in-vitro* preservation. CCRI has achieved plant regeneration in more than 20 Indian selections of both *C. arabica* (arabica) and *C. canephora* (robusta) through somatic embryogenesis. Hardening procedure has been evolved for micropropagated plants.

Large-scale trial plots of micropropagated plants are being established in different agroclimatic zones using 3 selections viz., Cauvery, Sln.9 and CxR. For the first time in any plant species, plant regeneration is achieved from the integument tissues in the CxR cultivar. Protocols have been optimized for direct and indirect plant regeneration from embryo culture. Plants derived from embryo culture of interspecific crosses between cultivated *C. canephora* (robusta) and indigenous wild species *C. bengalensis*, *C. travancorensis* and *C. wightiana* have been established in the field. Plant regeneration is achieved for the first time from the anther culture in the diploid CxR cultivar and from the endosperm cultures of *C. arabica* (S. 2803). Zygotic embryos of *C. arabica* have been preserved for 2 years under slow growth conditions and successful cryopreservation of zygotic embryos is achieved in three species. Protocols have been developed for isolation of protoplast from the embryogenic calli, and for isolation of DNA and producing RAPD and AFLP markers. The RAPD markers are being used for evaluating leaf rust differentials and genetic fingerprinting. Transient expression of gus gene is achieved in leaf tissues of CxR cultivar after co-cultivation with *Agrobacterium tumefaciens*. The future thrust areas include, evaluation and management of biodiversity with molecular markers, identification of molecular markers linked to leaf rust resistance and drought tolerance, engineering leaf rust resistance with antifungal genes from heterologous sources, isolation of leaf rust resistance genes and caffeine degradation genes, and developing Bt based biopesticides to combat major pests, apart from using the protoplast technology for introgressing useful genes from the wild relatives.