Assessment of the Genetic Diversity of Coconut with Special Reference to Phenotypes in the Galle District in Sri Lanka

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ABSTRACT

Genetic base of the coconut germplasm in Sri Lanka has been reported to be rather narrow. This has posed a serious restriction on the effort of the coconut breeders in developing new coconut cultivars which are essential in fulfilling the objectives of coconut breeding. In an effort to overcome this problem Coconut Research Institute of Sri Lanka initiated a programme for the identification of less known, diverse farmers' varieties of coconut. The research described in this thesis was carried out with the objective of identification of the farmers' varieties of coconut, *ex-situ* conservation of the newly identified material and *in-situ* characterization of the new phenotypes with morphological and molecular methods.

Out of the three locations; Wilpotha, Hettipola and Unawatuna where the germplasm exploration programme was carried out, the latter area in the Southern province proved to have diverse coconut germplasm which have not been identified in the previous Sri Lankan coconut classifications. Consequently, several new coconut phenotypes with specific vernacular names such as Ran pol, Juwan pol, Bothal thembili, Murusi, Thatin, Dothalu *etc* and several other phenotypes with no such vernacular names were identified and documented. A pollination programme was carried out to multiply such material and the resultant seedlings were conserved in the *ex-situ* field gene banks of coconut belonging to the Coconut Research Institute of Sri Lanka.

IPGRI descriptors for coconut were used to *in-situ* characterize the morphological diversity, of the new coconut phenotypes along with comparative already classified coconut forms, Sri Lanka Tall, Sri Lanka Green Dwarf, Bodiri Tall, San Ramon, King coconut and Sri Lanka Brown dwarf. The information gathered in the morphological characterization was used to classify the new coconut phenotypes into the existing taxonomic classification of coconut in Sri Lanka. Accordingly, the new phenotypes, Ran pol, Juwan, Thatin, Dothalu and Rath gon thembili were classified as different forms within the variety *Typica*, Murusi under variety *Nana* and Bothal thembili within the variety *Aurantiaca*. A higher level of morphological diversity was observed and the multivariate data analysis methods revealed the groupings of the new phenotypes along with their comparative coconut forms.

Molecular characterization was performed on 40 genotypes of coconut representing the new coconut phenotypes and their comparative coconut forms, at 13 microsatellite marker loci. All the markers were observed to be polymorphic and thus informative and a total of 88 different alleles were scored at a mean allele frequency of 6.7692 and a mean gene diversity of 0.6784. The genetic distances and the phenetic tree derived using genotypic data revealed the genetic relationships, genetic relatedness and the genetic diversity among the new coconut phenotypes and between their comparative coconut forms. The new coconut forms identified, characterized and conserved in this research will enhance the breeders' collection of coconut.