

Phylogenetic Affiliation of the “Endong”/ “Spaghetti” Variety of *Eucheuma* as Revealed by Molecular Data

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A carrageenan-producing seaweed locally referred to as “Endong”/ “Spaghetti” and initially regarded by farmers as a variety of *Kappaphycus* on the basis of morphological similarity has recently been shown to be a variety of *Eucheuma*, as indicated by its histological features and carrageenan type. Considering its unique combination of characteristics, it is of interest to determine the phylogenetic relationship of this seaweed with *Kappaphycus* and *Eucheuma* varieties. Three genetic markers were sequenced and analyzed to ascertain its phylogenetic affiliation: RuBisCo (*rbc*) spacer, a portion of the cytochrome oxidase subunit I (*cox1*) and a small segment of the plastid genome (*URP1*). Two samples separately collected from two sites (referred to by farmers as “Endong” and “Spaghetti”) were used. Phylogenetic analysis of the *rbc* spacer sequences confirmed the affiliation of “Endong”/ “Spaghetti” with *Eucheuma*; their *rbc* spacer sequences are in fact highly similar to that of *E. denticulatum*. Results of the analysis of *cox1* and *URP1* sequences, which were found to be slightly more polymorphic than the *rbc* spacer, were consistent with the results of the *rbc* spacer sequence analysis.

Key words: ‘Endong’, *Eucheuma*, *Kappaphycus*, phylogenetics, ‘Spaghetti’

INTRODUCTION

“Endong” is a rare seaweed variety that farmers in some coastal areas of the southern Philippines occasionally intermix with their major crops consisting of *Kappaphycus* varieties. Morphologically, “Endong” resembles certain varieties of *Kappaphycus* owing to the absence of spines in its major axes. Recent reports indicate, however, that it is a variety of *Eucheuma*. Montañó et al. (2007) reported that, unlike *Kappaphycus* varieties which produce kappa-carrageenan, “Endong” produces iota-carrageenan, a distinguishing feature of *Eucheuma* species (Santos and Doty 1978; Doty 1988). Trono et al. (unpublished data) also showed that in this variety, spinose determinate branchlets, while absent in the older portions, do occur in whorls at the younger branches, and that rhizoidal cells are present at the axial core; these morphological and histological characteristics are typical of *Eucheuma* (Doty 1988). Trono et al. (unpublished data) concluded that “Endong” is a ‘form’ of *E. denticulatum* (Burman) Collins and Hervey and provided its taxonomic identification as *E. denticulatum* (Burman) Collins and Hervey f. *elongata* (Weber-van Bosse) Trono and Ganzon-Fortes comb. nov.

A seaweed variety that is morphologically similar to “Endong” has also been observed in seaweed farms in the Visayas region; the variety is locally referred to as “Spaghetti”. Their morphological similarity suggests that “Endong” and “Spaghetti” could represent the same variety, but this hypothesis awaits molecular verification.

While the taxonomic status of “Endong” as a species of *Eucheuma* has to a certain extent been elucidated, its morphological divergence from the other species of *Eucheuma* raises the question of whether the observed morphological divergence also reflects its phylogenetic relationships with *Kappaphycus* and *Eucheuma* varieties. In particular, it is of interest to determine to which group (i.e., to *Kappaphycus* or *Eucheuma*), and to what degree, is this variety more closely related; and to assess how phylogenetic information can be used to clarify its taxonomy.

To address this problem, this study employed molecular markers to generate a model of the phylogeny of the “Endong” variety. Because the RuBisCo (*rbc*) spacer has already been successfully used to assess species-level relationships in the *Kappaphycus-Eucheuma* group (Zucarello et al. 2006), this marker was used in the study. In