

A taxonomic study of *Quercus* (Fagaceae) in Vietnam based on molecular phylogeny and morphological observations

ホアン, ティ, ビン

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氏 名 : ホアン ティ ビン

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論 文 内 容 の 要 旨

The genus *Quercus*, with more than 500 species, is one of the largest genera in the family Fagaceae. The species is widely distributed in the world and often dominant in temperate deciduous forests in eastern North America, Europe and Asia, Mediterranean and desert scrub forest in Europe, Mexico and adjacent regions, and tropical montane forests in Southeast Asia. Species delimitation in *Quercus* has been based on morphological characters and some genetic markers. However, those characters and markers often exhibit broad ranges of intraspecific variation most likely due to co-occurrence of some species in ecologically heterogeneous habitats and their interspecific hybridizations in many species pairs. As for genetic markers, widely used DNA barcoding regions such *rbcL*, *matK* and ITS do not always provide clear discriminating signals at the species level in *Quercus* because of the existence of paralogous loci.

In Vietnam, botanical surveys had a long blank period from 1930s to 2000s when 40 species of *Quercus* were reported. The taxonomic treatment of the genus *Quercus* in Vietnam remains to be revised, because of insufficiently available materials and wide morphological variation in leaves and fruits, which led to confusions of taxonomy and difficulties in identification and numerous scientific names are still controversial.

In this thesis, species taxonomy of the genus *Quercus* in Vietnam is revised based on the morphological comparison and molecular phylogenetic analysis. The species identification was consulted based on our recent collections obtained from a series of our field surveys in Vietnam and surrounding countries, literature review and type specimens of each species in the herbaria as well as digital specimen images on JSTOR Global Plants. Both three classic barcoding regions and genome-wide markers using the next generation sequencing platform (MIG-seq) were used to clarify the relationships among the closely related species of *Quercus* in Vietnam.

Based on morphological and molecular evidence, the taxonomy of *Quercus langbianensis* complex and its relatives or similarities in Vietnam and Cambodia was revised and a key for each species in the complex was provided. We also identified 43 species of *Quercus* from Vietnam, including 15 undescribed species newly described as *Q. baolamensis*, *Q. bidoupensis*, *Q. honbaensis*, *Q. trungkhanhensis*, and *Q. xuanlienensis*, and tentatively named as *Q. pseudocamusiae*, *Q. fansipanensis*, *Q. haivanensis*, *Q. ngoclinhensis*, *Q. semiundulata*, *Q. sontraensis*, *Q. theifolia*, *Q. tiepii*, *Q. verticillata*, and *Q. vuquangensis*. Two species *Q. bella* and *Q. disciformis* are newly recorded from Vietnam. In addition, the following six species that are not listed in the Illustrated Flora of Vietnam were confirmed as distinct: *Q. baniensis*, *Q. blaoensis*, *Q. dilacerata*, *Q. donnaiensis*, *Q. platycalyx*, *Q. sessilifolia* and *Q. xanthoclada*.

According to the evidence provided, the species of *Quercus* in Vietnam rose from 40 to 59 species. This

figure shows that Vietnam is the center of species diversity of *Quercus* in Asia next to China.