

GENETIC DIVERSITY STUDIES ON *FICUS*

By

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ABSTRACT

In the present investigation, an extensive study was conducted to address the morphological and molecular characterization of seventeen *Ficus* species, thirty-five common fig (*Ficus carica* L.), and seven sycomorus fig (*Ficus sycomorus* L.) samples grown in Egypt in order to be preserved in the Gene Bank. The morphological characterization was conducted according to the Fig (*Ficus carica*) IPGRI descriptor (2003). The seventeen *Ficus* species were morphologically characterized using twenty leaf characters, while, the molecular characterization was conducted using 15 SSR primer pairs, 7 AFLP primer combinations and 2 DNA barcoding loci (*rbcL* and *matK*). The one-way ANOVA test for the four measured morphological traits showed significant differences among the seventeen species. *F. microcarpa* Hawaii showed the lowest value for both leaf length and leaf width, while, the highest leaf length and leaf width were revealed by *F. hispida* and *F. carica*, respectively. Moreover, most of the leaf descriptive characters showed variability among the studied species, and *F. carica* possessed the distinctive unique descriptive character of leaf lobation. The seven AFLP primer combinations amplified 622 amplicons, while, the fifteen SSR primers revealed 76 alleles. Although the percentage of polymorphism detected by SSRs (98.68%) was comparable to that of AFLPs (98.49%) however, only 10 species were characterized by 16 SSR unique positive markers. On the other hand, the AFLP markers amplified 100 unique positive/negative markers and were able to identify each of the seventeen species. Moreover, the *rbcL* DNA barcode was successfully amplified in the seventeen species. Meanwhile, the *matK* primers failed to amplify in the DNA of *F. lutea* species. The *rbcL* and *matK* sequences for the three species (*F. afzelii*, *F. platypoda* and *F. trijuja*) were submitted and recorded as new entries in the GenBank-NCBI database. Twenty leaf-morphological characters and fifteen SSR markers were used to characterize thirty-five common fig samples representing nine varieties/cultivars grown in Egypt. The one-way ANOVA test revealed high variation in the leaf measured traits. The leaf length means value ranged from 12.05 to 28.33 cm. While, the leaf width revealed an average ranging from 9 to 23 cm. In addition, the petiole length/leaf length and petiole thickness characters ranged from 0.18 to 0.58 mm and from 0.35 mm to 0.9 mm, respectively. Out of the 16 descriptive characters, four characters (petiole color, petiole cross section, leaf venation and leaf margin dentation) showed the same character type across the thirty-five fig samples. The fifteen SSR markers revealed 22 alleles, with an average ranging from 1 to 3 alleles/marker. The SSR-based dendrogram assigned 9 out of the 12 groups of samples to their corresponding variety/cultivar, while the morphological characters assigned only 6 groups. Concerning the seven sycomorus fig samples, only one leaf measured character (petiole length/leaf length) and one descriptive trait (petiole length) showed significant differences among the studied samples. Moreover, the molecular characterization using the two SSR markers sets showed a total number of alleles 26 and 23 amplified by Set-1 and Set-2, respectively. Only two samples (No. 7 and 1) were characterized by 5 unique SSR markers (3 and 2, respectively). However, a unique SSR fingerprint was identified for each of the seven samples.

Key words: *Ficus*, AFLP, SSR, DNA Barcoding, morphological characterization, genetic diversity.

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