ABSTRACT

Many plants have been identified as potential biofuel crops to meet the increased demand for energy. As researchers attempt to exploit and improve the traits of significance, genome and phenotypic information becomes critical. In this study, flow cytometric investigation has been done to estimate the genome size of four socio-economic non-edible oil crops viz. *Pongamia pinnata*, *Jatropha curcas*, *Ricinus communis*, and *Mesua ferrea*. The genome size / 2C nuclear DNA content were in the following order: *J. curcas* (0.86 pg/2C DNA) < *R. communis* (1.01 pg/2C DNA) < *M. ferrea* (1.52 pg/2C DNA) < *P. pinnata* (2.49 pg/2C DNA). Intra-specific variations were observed in genome size whereas no such variations in the chromosome number were detected in plants collected from different eco-geographical regions of Assam. This is attributed to reverse *transcriptase-RNase H* (RT-RH) domains of Ty1-*copia* retrotransposons. Dot-blot analysis revealed that the Ty1-*copia* accounts for 2 % to 9.5 % of the total haploid nuclear genome for the studied plants and phylogenetic analysis showed that RT-RH sequences are heterogeneous that resolved into distinct groups. The results contribute to preliminary understanding about genome organization and evolution. Genome size is also known to affect various plant cellular traits, thus, the correlation was drawn by studying cell phenotypic characters as well. The correlation was, however, found to be growth form dependent. Genome size has been found to be influenced by environmental factors; hence, anatomical changes in leaves of *Pongamia, Jatropha, Ricinus and Mesua* were studied under drought stress and salinity stress and their significance was evaluated by numerical analysis. Some anatomical features related to leaf viz. stomatal length, pore size and average number of stomata and epidermal cell area were found to be important characters that varied in plants under stress and were statistically significant. Relative water content, root: shoot ratio, total chlorophyll content, and relative growth rate were measured and values were found to be lower in stressed plants compared to the control. The phytochemical study was carried out which concluded that although plants have exercised anatomical and physiological changes due to stress, there is no weighing down in biochemical properties of these versatile plants. Therefore studied plants are idle candidates to be grown under abiotic stress condition without much productive loss. Since seeds of these plants are the source for biodiesel production thus; seed loss during germination will hamper the economic sector. Biomarker using cell cycle activity and reactive oxygen species (ROS) accumulation intensity has been studied which not only will help to identify the seed germinating stage but also facilitate a better understanding of seed priming treatments.