Sesame (Sesamum Indicum L.): Molecular Breeding and Transformation

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Abstract : Sesame (Sesamum indicum L.) is among the most important oilseed crops for its high edible oil quality and quantity. Sesame is grown for food, medicinal, pharmaceutical, and industrial uses. Sesame is also cultivated as a main cash crop in Asia and Africa by smallholder farmers. Despite the global exponential increase in sesame cultivation area, its production and productivity remain low, mainly due to biotic and abiotic constraints. Notwithstanding the efforts to solve these problems, a low level of genetic variation and inadequate genomic resources hinder the progress of sesame improvement. The objective of this paper is, therefore, to review recent advances in the area of molecular breeding and transformation to overcome major production constraints and could result in enhanced and sustained sesame production. This paper reviews various researches conducted to date on molecular breeding and genetic transformation in sesame focusing on molecular markers used in assessing the available online database resources, genes responsible for key agronomic traits as well as transgenic technology and genome editing. The review concentrates on quantitative and semi-quantitative studies on molecular breeding for key agronomic traits such as improvement of yield components, oil and oil-related traits, disease and insect/pest resistance, and drought, waterlogging and salt tolerance, as well as sesame genetic transformation and genome editing techniques. Pitfalls and limitations of existing studies and methodologies used so far are identified and some priorities for future research directions in sesame genetic improvement are identified in this review.