Genetic and Virulence Diversity among Alternaria carthami Isolates of India

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Abstract : Alternaria leaf spot caused by Alternaria carthami is one of the most devastating diseases of safflower. It has resulted in huge losses in crop production and cultivation leading to a fall out of India's rank as the leading producer of safflower in the world. Understanding the diversity of any pathogen is essential for its management and for the development of disease control strategies. The diversity of A. carthami was therefore analysed on the basis of biochemical, pathogenicity and genetic lines using ISSR markers. Collections and isolations of 95 isolates of A. carthami were made from major safflower producing states of India. Virulence was analysed to evaluate the pathogenic potential of these isolates. The isolates from Bijapur, Dharwad districts (Karnataka), and Parbhani and Solapur districts (Maharashtra) were found to be highly virulent. The virulence assays showed low virulence levels (42%) for the largest part of the population. Biochemical characterization to assess aggressiveness of these isolates was done by estimating the activity of cell wall degrading enzymes where isolates from districts Dharwad, Bijapur of Karnataka and districts Parbhani and Latur of Maharashtra were found to be most aggressive. Genetic diversity among isolates of A. carthami was determined using eighteen ISSR markers. Distance analysis using neighbour joining method and PCoA analysis of the ISSR profiles divided the isolates into three sub-populations. The most virulent isolates clustered in one group in the dendrogram. The study provided no evidence for geographical clustering indicating that isolates are randomly spread across the states, signifying the high potential of the fungus to adapt to diverse regions. The study can, therefore, aid in the breeding and deployment of A. carthami resistant safflower varieties and in the management of Alternaria leaf spot disease.

Keywords : alternaria leaf spot, genetic diversity, pathogenic potential, virulence
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