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Research Article

Analysis of genetic diversity among different *Ricinus communis* genotypes for macrophomina root rot through RAPD and microsatellite markers

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ABSTRACT

Due to Macrophomina root rot the production of castor has been affected at large. Molecular diversity encompassed in castor offers an efficient means of exploiting disease resistant varieties. Three DNA-based molecular marker techniques, *viz*., random amplified polymorphism DNA (RAPD), inter simple sequence repeat (ISSR), and simple sequence repeat (SSR) were used to assess the genetic diversity in castor genotypes. Out of the 25 RAPD, 24 ISSR and 10 SSR primers screened, a total of 29 polymorphic primers (10 RAPDs, 10 ISSRs and 9 SSRs), were used in this study. Amplification of genomic DNA of 8 genotypes, using RAPD analysis, yielded 92 fragments, of which 72 were polymorphic, with an average PIC value of 0.29. Number of amplified fragments with RAPD primers ranged from 4 t o 13, with the size of amplicons ranging from 100 to 2650 bp in size. The polymorphism ranged from 54.54 to 100.0, with an average of 79.54 per cent. The 10 ISSR primers produced 97 bands across 8 genotypes, of which 55 were polymorphic, with an average PIC value of 0.50. The number of amplified bands varied from 7 to 13, with size of amplicons ranging from 100 to 1600 bp. The percentage of polymorphism using ISSR primers ranged from 28.57 to 85.71, with an average of 56.29 per cent. Similarly, SSR analysis yielded 16 fragments, of which 11 were polymorphic, with an average PIC value of 0.87. Clustering of genotypes within the groups was not similar when RAPD, ISSR and SSR derived dendrograms were compared, whereas, the pattern of clustering of the genotypes remained akin in RAPD and combined data of RAPD, ISSR and SSR. The similarity coefficient ranged from 0.60 to 0.86, 0.63 to 0.80, 0.57 to 1.00 and 0.64 to 0.83 with RAPD, SSR, ISSR, and combined dendrogram, respectively. Knowledge on the genetic diversity of castor can be used to future breeding programmes for increased oil production to meet the ever increasing demand of castor oil for industrial uses as well as for biodiesel production.

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INTRODUCTION

Castor (*Ricinus communis* L., 2n =2x = 20) is a tropical plant that belongs to the Euphorbiaceous family and is grown for its non-edible oilseed. It is cultivated around the world because of the commercial importance of its oil. India is the world's largest producer of castor seed and meets most of the global demand for castor oil. India contributes 750,000 tons annually, and accounting for over 60 per cent of the entire global production. The seeds of castor contain more than 45 per cent oil and this oil is rich (80–90%) in an unusual hydroxyl fatty acid, ricinoleic acid (Jeong and Park, 2009). Castor oil is the only vegetable oil soluble in alcohol, presenting high viscosity, and requiring less heating than others oils during the production of biodiesel (Jeong and Park, 2009). Due to its unique chemical and physical properties, the oil from castor seed is used as raw material for numerous and varied industrial applications, such as manufacture of polymers, coatings, lubricants for aircrafts, cosmetics, etc, and for the production of biodiesel (Jeong and Park, 2009). With more than 95 per cent of the world's castor production concentrated in limited parts of India, China, and Brazil (Sailaja *et al*., 2008), and because of the ever increasing world- wide demand of castor