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Wide hybridization and embryo rescue for crop improvement with special reference to Solanum and Capsicum

Wide-hybridization is an important tool in the hands of the plant breeder and a cytogeneticist. It is the first step to transfer genes of the wild species into the cultivated ones. Stebbins (1950) divided crossability barriers into two broad groups, namely pre-fertilization and post-fertilization barriers. To bypass post-fertilization barriers, embryo-rescue, ovule culture and manipulations with protoplasts have been successfully used.Tomato is highly prone to biotic stresses especially diseases, insects and nematodes. Fusarium wilt, Late blight and early blight are important diseases. Tomato fruit borer (Helicoverpa armigera) is an important insect pest of tomato. This brings yield reduction and also production of poor quality fruits and sometimes total death of the plant. Development of resistant varieties is the cheapest mean to manage the stress causing organism. The wild species are reservoir of important genes which when used in breeding programmes can yield better quality tomato plants and fruit. S. pimpinellifolium and S. peruvianum contain genes which confer resistance to Fusarium wilt (Fusarium oxysporum fsp lycopersicae) and early blight (Alternaria solani) (Kalloo, 1986). But there has been very little success due to problems in crossability. Solanum lycopersicon was crossed with the wild species S. peruvianum and S. pimpinellifolium. No fruit set was recorded in S. peruvianum x S. lycopersicum MT-3 and S. peruvianum x S. lycopersicum var. KA. Twenty five days after pollination was found to be the optimum time for rescuing the embryos. At 35 days after pollination most of the embryos had aborted. Medium supplemented with 1 mg/l GA_3, 0.1 mg/l NAA and 0.5 mg/l BAP was found to be the most effective for germination of the immature putative hybrid embryos. The confirmation of hybridity was done using RAPD markers. The hybridity of the embryo rescued plants was best resolved by primer OPAB-18 and primer OPAB-17. Chilli belongs to the genus Capsicum, which is among the world's extensively grown spice crops. India ranks first with an average yield of 1.6 mt ha^{-1} from the total cultivated area of 7.67 lakhs ha. In Meghalaya, it is the third most important spice crops after ginger and turmeric with an area of 1900 hectares and a production of 2300 tonnes. However, disease namely, tobacco mosaic virus (TMV), root rot, tomato spotted wilt virus (TSWV), etc. leads to a considerable decline in yield. It is therefore necessary to transfer the important genes for various characters from one species to another. But there has been very little success due to problems in crossability. The present investigation was carried out on three species viz., Capsicum annuum, Capsicum chinense, and Capsicum frutescens, to determine whether this low success in crossability is due to pre-fertilization problems and to find out the optimum timing for embryo rescue which was found to be 27-33 days after pollination (DAP). The highest percentage of embryo growth was observed with the hormone concentration of 0.5 mg/l GA_3 and 0.05 mg/l NAA. Hybrid plants were obtained and their hybridity was confirmed using both morphological and molecular markers (RAPD).

Biography

Vijaya K.Kanna completed his B.Sc from Delhi Univesity, M.Sc Genetics and Ph.D from H.A.U., Hisar, Haryana and he is FAO of UN Fellow in The University of Queensland, Australia. He has published 55 research papers in the Journal of International level and 85 in National Journals.

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