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Breeding and Cytogenetic studies of Plantago ovata Forsk & some of its wild allies

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The genus Plantago of family Plantaginaceae includes about 275 species. These are small, annual or perennial herbs with various medicinal properties. The word Plantago is taken from the "planta" which means "sole of the foot". Plantago ovata is the only cultivated and economically important species of the monotypic genus Plantago and yields Isabgol- a very effective laxative and its export earns India foreign exchange worth INR 2.5 billion. P. ovata is generally an in-breeder and is characterized with narrow genetic base, because of low chromosome number, chromosome size, chiasmata frequency, recombination index and abundance of heterochromatin in chromatin material. Various plant breeding methodologies like selection, hybridization, induced mutations, polyploidy and tissue culture have been used for genetic amelioration of this crop. But the results have not been encouraging. The mitosis studied from feulgen stained young plant root tips and/or germinated seeds in four species of Plantagos, P. ovata Forsk., Plantago lagopus L., P. lancolata L. and P. major L., revealed normal karyotypes, which were then subjected to idiogram preparation and morphological characterization of chromosomes. The meiosis was studied from young spikes of these four species which were fixed in a mixture of 4 parts chloroform, 3 parts ethyl alcohol, and 1 part acetic acid at 8:0 a.m to 8:30 a.m. and kept undisturbed for 24 hours. After 24 hours duration, the fixed spikes were washed in tap water and stored in 70% ethyl alcohol at 4°C till further use.The anthers were squashed in 1% acetocarmine and meiosis was studied in pollen mother cells. The various stages of meiosis viz; pachytene, diplotene, diakinesis, metaphase and anaphase were observed. The number of rod bivalents was 4 in P. ovata, 6 in P. lagopus, 4 in P. lanceolata, and 5 in P. major. In P. lanceolata ring bivalents were 2 in number and in P. major ring bivalent was one. The chiasmata frequency was calculated at Metaphase I and diakinesis. The other parameters studied included Recombination index and terminalization coefficient. The recombination index at diakinesis of P. ovata, P. lagopus, P. lanceolata, and P. major was 10,18,17,17 and at metaphase were 7,8,8,8 respectively. The terminalization coefficient was 0.33 in P. ovata, 0.5 in P. lagopus, 0.25 in P. lanceolata, and 0.25 in P. major. Anaphase was regular in all except P. lagopus. Some chromosomal variations were also observed.

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