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Induction and identification of autotetraploidy in ashwagandha (*Withania somnifera* Dunal.)

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ABSTRACT : Seed treatment with aqueous colchicine solution was carried out for induction of autotetraploidy in ashwagandha in four accessions (Shilpa, Acc. 17, Bydyanath and MWS-327). Increased stomatal size and decrease in stomata density aided in detection of autotetraploids. Among four ashwagandha accessions tried, Acc. 17 was more responsive for the induction of autotetraploids. Colchicine at 0.5 per cent seed treatment was found to be more effective for eight hour duration. Among three different durations of treatment (3, 6 and 8h), 8h treatment showed better in expression of tetraploid characters.

KEY WORDS : Seed treatment, Ashwagandha, Colchicine, Induction, Autotetraploidy, Genetic improvement

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Ashwagandha (*Withania somnifera* Dunal.) is an important solanaceous medicinal crop. Its somatic chromosome number 2n=48. Its roots, leaves and seeds are used in Ayurvedic and Unani systems of medicines. Its various preparations and forms have been used for the cure of nervous disorders, rheumatism, emaciation in children, leucoderma, tuberculosis, etc. (Srivastava, 1995). It is low input demanding crop, grows on marginal lands and is being commercially cultivated in different parts of the country for its roots. Although wide genetic variability is reported for root yield and total alkaloid content, the crop improvement through hybridization for increasing root yield and/ or alkaloid content has not been successful. Alternatively, manipulating the ploidy levels using colchicine treatment has been shown to increase the alkaloid levels in several other solanaceous species of medicinal importance.

Genetic improvement approach aim to increase the root yield in general and alkaloid content in particular. The breeding experiment conducted so far in this crop is by selection of superior genotypes and by intervarietal hybridization to transfer genes from wild type to exploit hybrid vigour. Since there is no report of male sterility in this crop and emasculation is difficult and seed setting is poor in crosses, commercial exploitation of hybrid vigour has not been possible till now (Patidar *et al*., 1990). There is a vast scope for ploidy breeding and it is an area in which can easily create variability and exploit it for commercialization.

RESEARCH METHODS

Four accessions of Ashwagandha *viz.*, Shilpa, Acc. 17, Bydyanath and MWS-327 were used for induction of autotetraploidy. Hundred seeds of each of the genotype were directly soaked in 0.50 per cent aqueous solution of colchicine for three durations like 3, 6 and 8 hours at room temperature. After thorough washing with distilled water, the treated seeds along with their respective untreated control were sown in the rows in the experimental field. Suspected autotetraploids were compared for stomata of leaf epidermal layer characters. Large stomata with low stomatal density were seen as criteria for identification of induced autotetraploidy. Stomatal density was examined following the usual acetocarmine staining at room temperature. The data were recorded on stomatal characters for aqueous colchicine treated plants along with control plants.