ABSTRACT

*Withania somnifera* (L.) Dunal known as Ashwagandha or Asgandh has a high repute in traditional Indian medicine. It possesses immense therapeutic value against a large number of ailments such as mental diseases, asthma, inflammation, arthritis, rheumatism, tuberculosis and a variety of other diseases including cancer. It is also called ‘Indian Ginseng’ for its rejuvenating properties. The therapeutic potential of *W. somnifera* is attributed to presence of secondary metabolites mainly, tropane alkaloids and withanolides (steroidal lactones). However, its commercial cultivation is adversely affected by poor seed viability and germination. Infestation by various pests and pathogens, survival under unfavourable environmental conditions, narrow genetic base and occurrence of morpho-chemotypic variations are some of the other existing challenges in the crop. With the growing realization of benefits and associated challenges in the improvement of *W. somnifera*, studies on development of efficient *in-vitro* propagation system, exploration of genetic and chemotypic variations, identification and characterization of important genes and understanding the secondary metabolites production and their modulation has gained significant momentum. Micropropagation which is an important tool for rapid multiplication of elite chemotypes and broadening the genetic base, requires optimization of number of factors such as nutrient medium, status of medium (agar-gelled and liquid), type of explant, plant growth regulators etc. Similarly, an efficient and reproducible *in vitro* regeneration system is a prerequisite for the development of genetic transformation protocol and requires precise manipulation of various intrinsic and extrinsic factors. *In vitro* propagation system could also be used as a model to get insights into the accumulation and transport of secondary metabolites. Further, an understanding of occurrence of morpho-chemotypic variations among the cultivars of *W. somnifera* would be instrumental in designing strategies for modelling the plant for higher commercial values. Identification and characterization of key genes involved in biosynthesis of pharmaceutically important metabolites would provide vital clues about their synthesis and regulation which in turn will immensely helpful in engineering the plant for specific metabolites.