ABSTRACT

The population of many medicinal plants are depleting rapidly from their natural habitat because, even now, they are mostly collected from wild and sent to ready markets in the cities. Conservation, cultivation and mass propagation of these plants are urgently needed to ensure their availability to the mankind for pharmaceutical and traditional practices. Commercial cultivation may serve as an effective means to conserve the rarest species, genetic wealth and protect endangered species. Appropriate cropping patterns with scientific bound agro technologies is needed to incorporate medicinal plants into the conventional agricultural and forestry cropping system (Chettri *et al.,* 2005; Pradhan *et al*., 2014).

The present experimental plant chirata was not found to be an exceptional species. *Swertia chirayita* (Roxb. ex Fleming) Karsten is among the several medicinal plant species growing in the Himalayan region. It is a critically endangered medicinal herb belonging to the Family Gentianaceae and is now on the verge of extinction. *S. chirayita* is also mentioned in the literature as *S. chirata* Buch.-Ham.; *Ophelia chirata* Grisebach; *Agathotes chirayita* Don; *Gentiana chirayita* Roxburgh and *Gentiana floribunda* Don. The trade name of *S. chirayita* is chiretta. Despite its medicinal properties and use in the herbal industry, *S. chirayita* could not get much attention on conservation and cultivation, particularly in areas near its natural population. Therefore, the plant is still collected front the wild to meet industrial demand. In this investigation, a detailed study was carried out on some physiological and biochemical aspects of the plant, but emphasis was laid on analyzing the negative yield attributing characters of the plant on improvement of crop yield.

Swertia chirayita has some negative or deleterious features like erratic seed germination behaviour (Raina *et al*., 1994), poor seed germination vigour, long gestation period and maximum biomass loss during packing and storage. Keeping in mind these prime negative yield attributing characters of chirata plant, an attempt was made to improve crop yield simply by using some growth regulators which have been established as potent promoters or suppressors of vegetative growth in many agricultural and horticultural plants. In fact, foliar application of growth promoters exert their physiological action by enhancing cell division and cell elongation without altering their

gross morphology and causing any drastic adverse effects (Amanullah *et al*., 2010) whereas the growth retardants slowed down the cell division and elongation process (Cathy, 1964; Bhattacharjee *et al.,* 1986).

In the present investigation, mature chirata seeds were collected from different adjoining places of Darjeeling like Sepi (Rimbik), Khopi Dara (Maneybhanjang), Permaguri (Sukhia Pokhri), Lami Dara (Pussumbing) and Majidhura (Sukhia Pokhri) during the month of December-January. Plant seeds from Permaguri (Sukhia Pokhari) had the highest viability and germination percentage (Lama *et al*., 2012). Thus, the chirata seeds of this particular place *i.e.,* from Permaguri (Sukhia Pokhari) were collected locally and used as experimental material. Two types of plant growth regulators, *viz.*, plant growth promoters – Gibberellic Acid, Indole Acetic Acid and Kinetin and plant growth retardants *viz.*, Maleic Hydrazide, Succinic Acid Dimethyl Hydrazide and Abscisic Acid, were used as the test chemicals with a view to obtaining the desired modification of growth, metabolism and yield of highly exploited medicinal plant chirata (*Swertia chirayita* Roxb. ex Fleming).

After initial screening of a suitable varietal type (plant seeds from Permaguri), determining the discreet phase in the life cycle of this species and selecting of optimum concentration range of the growth regulators suitable for this plant were followed by the application of those PGRs timed at three different developmental stages of plant, *viz.*, rosette stage, sapling stage and pre-flowering stages of the plant. The PGRs-induced changes in some growth and biochemical parameters were analyzed at different developmental stages of the plant; reflection of growth promoting and retarding chemicals in the plants was studied and their effects on plant growth, metabolism and yield have been recorded. The results obtained in this investigation were discussed at length from the available literature in this field and allied field of research.