GENERAL INTRODUCTION

In recent years antifertility agents such as norethynordrel, 19-nortestosterone and norgestrel i.e., norethisterone, lynestrenol, estrogen and progesterone etc. are very much used for controlling the present context of population explosion (Djerassi, 1966 ; Weston, 1976). Thus contraceptive steroids and antiinflammatory agent (Beta methasone, dexamethasone etc.) derived from corticosteroids are two major groups of steroids manufactured presently on an industrial scale (Weston, 1976) have been necessitated a greater supply of the naturally occurring steroid precursor from which these drugs can be prepared on large scale.

Out of various steroidal precursors, diosgenin has been noted to be the most important source of raw material for the synthesis of steroid drugs (Applezweig 1962, 1969). Supply of diosgenin are ultimately limited due to several reasons (Martin, 1972). These are the restrictions of diosgenin production, unwillingness to rely solely on one supplier and in many cases a desire to use interval production to conserve foreign exchange. Solasodine which is a nitrogen analogue of diosgenin can effectively serve as a replacement for that material (Mann, 1978).

The chemical work done in the last few decades on solasodine has been particularly stimulated by the statement of Sato *et al.*, (1951 b) who announced first the chemical transformation of the spiroaminoketal alkaloid, solasodine into three beta-acetoxy pregna-5, 16-dien, 20-one. Since the pregnene is important intermediates in the industrial production of hormonal steroid, solasodine has been receiving an increased interest and significance as a starting material for the pharmaceutical use (Schreiber, 1968). Solasodine can be degraded to 16-dehydropregnenolone acetate i.e., 16-DPA with an over all yield (Ca 65%) by a process. 16-DPA gained considerable industrial significance because of its utilisation as a basic precursor for commercial production of four groups of steroidal drugs such as corticosteroids pregnenes, androsterones and 19-norsteroids (Sato *et al.*, 1959; Fieser and Fieser, 1959 ; Fakih and Hammied, 1964). Other potentially important synthetic steroids are being derived from solasodine with the help of several novel reactions (Sato and Nagai, 1972 ; Adam and Schreiber, 1966).

Solanum viarum Dunal has recently come into prominance as one of the richest source of solasodine. Among the 42 different indigenous *Solanum* species investigated so far in India (Choudhuri and Rao, 1964; Bahadur and Dayal, 1968 ; Gadwal, 1977 ; Kaul and Atal, 1978; Maiti *et al.*, 1979;

Kaul and Zutshi, 1982; Krishnan, 1985) this plant is ammenable to successful cultivation over a wide range of soil and berries show wide variation in solasodine content ranging from 2.5% to 5.4% on dry weight basis (Maiti et al, 1964 ; Saini et al., 1965; Saini and Biswas, 1967 ; Bakshi and Hammied, 1971 ; Khanna and Murty, 1972; Puri and Bhatnagar, 1974; Singh and Khanna, 1989 ; Kaul and Zutshi, 1977; Reddy et al., (1991). It has been estimated that average four metric tons of berries per hectare may yield 0.215 metric tons of solasodine and 400 hectare of lands would be sufficient for the annual production of 54 to 65 metric tons of solasodine, the actual requirement for steroid industry in India at present (Datta, 1971).

Though most of the interest in solasodine bearing plants is due to their potential conversion of solasodine to synthetic drugs, there is however, some biological activity of glycoalkaloid as such. The two potential components of the plant i.e., solasodine and glycosides of solasodine are effective against dermatomycosis in animal (Kamyszek, 1974). Moreover they have significant inhibitory activity on the terminal cancer, sorcoma 180 (Chan et al., 1980) and showed promising results on the patients with skin tumours. Moreover , recently Chiappeta (1988) has shown antimicrobial activity of S. viarum extract on gram +ve, gram -ve, and fungi.

Solanum viarum Dunal is a common obnoxious species growing in and around Darjeeling district. It is obvious therefore that research work on the plant from utilitarium point of view will be of much economic value in the region.

The productivity of glycoalkaloid is very much dependent on growth and development of plant. Nigra *et al*, (1990) studied the effect of carbon and nitrogen source on growth and solasodine production in batch suspension culture. Debata and Patnaik (1988) studied the growth of *S. viarum* by the application of tissue culture. Sinachakr *et al*, (1988) also studied somatic hybridization of the plant. But plant physiological investigation on *S. viarum* is very necessary to solve certain problems which have so far been neglected. Besides chemical investigation on the plant part is very much complementary to the investigation on plant physiology. The isolated chemical constituents not only give the idea of the product of commercial interest but they are also helpful for better understanding of biological activity of these chemical constituents in the plant.

Though preliminary work on chemical isolation of glycoalkaloid was performed by Maiti *et al*., (1964, 1965) several other authors also studied the productivity of glyco-alkaloid in the fruit under various conditions (Bakshi and

Hammied, 1971; Chandra et al., 1970; Choudhuri and Hazarika, 1966; Khanna and Murty, 1972; Krishnan, 1985). Reddy et al, 1991; Amiruddin and Salim 1990; Sharma et al., (1979) attempted to study the yield of glycoalkaloid in the fruits of *S. viarum* Dunal as a whole and much emphasis has been given on the fruit skin or pulp in connection with biosynthesis and accumulation of glycoalkaloid disregarding the role of seed on this particular aspect of study. But from preliminary work it has been observed that seed has considerable amount of glycoalkaloid. Moreover from anatomical preparation the plant part which is the store house of glycoalkaloids has been noted to be the part and parcel of the seed. Thus an attempt has been made to isolate and characterise various chemical constituents from seeds collected freshly from the fruit to understand the role of seed on productivity of glycoalkaloid of commerce and also various other chemical constituents related to biological activity during their germination. Besides thorough phytochemical analysis has been made to investigate chemical constituents in different parts of fruit and seed. Moreover chemical investigation has been made to non-viable seeds stored for a long time to understand the fate of chemical constitutents during storage.

The study on seed germination behaviours of such an important plant is very essential specially when raising of large number of seedling is necessary in connection with its commercial cultivation. Sharma and Varghere (1980) reviewed the literature pertaining to this biologocal phenomenon and according to them low germinability is a acute problem. Recently Ghazi and Malthees (1990) has shown inhibitory activity of solasonine, solamargine and solasodine on lettuce seed radicle elongation. Decline in percentage of seed germination has been observed during storage of seed in laboratory condition. It reaches non-viability after five years of its storage. The seed also shows decline in percentage of germination within one year after its collection. Thus much of stored seeds are becoming useless after a certain period of time. It has been the experience that some of the chemicals like vitamins have the ability to stimulate germination of seed having low germination capacity due to storage. Thus attempt has been made to screened out certain chemicals which may be helpful to stimulate germination of considerable amount of seed which are becoming useless during storage.

According to Roddick (1974) the steroidal alkaloid like solasodine is a typical "alkaloid imperfecta". Acetyl COA has been considered to be the starting point of the pathway for steriodal biosynthesis in plants and he observed that during biosynthesis of solasodine, a nitrogen analogue of diosgenin nitrogen is added much late during its biosynthesis. Recently Abdel-Galil et al., (1989) has shown that L-arginine is most likely contributes nitrogen in the biosynthesis of solasodine. Kasteleinand Erney (1990) isolated trypanosomatid protozoa in fruit of S. viarum. Roddick et al., (1990) showed membrane distrupting property of steroidal glycoalkaloids, solasonine and solamargin. But no attempt has so far been made on the fruit physiology in the plant. Thus growth physiology of developing fruit has been studied with special emphasis on estimation of various biochemical parameters with a view to understanding their metabolic relationship to the alkaloid synthesis during development of fruit.

Though very recently the effect of gamma irradiation on growth of S. viarum has been worked out (Chandel, 1989). The treatment of commercially important plant with the chemicals have long been utilised to increase productivity of plant. But information is meagre in connection with the study on growth performances on S. viarum Dunal with special reference to its productivity, due to effect of various chemicals. Only scattered information on the effect of GA (Mukherjee et al., 1968), phloridzin (Dutta et al., 1973), ascorbic acid (Varghere et al., 1979) and application of nitrogen (Choudhuri et al., 1979) are available. Thus attempt has been made to study of growth performance of *S. viarum* Dunal under the treatment of various chemicals which have long been considered as effective in connection with the modification of growth and development of plant vis a vis the productivity of glycoalkaloid.

With this background the plant has been studied from plant physiological point of view with special emphasis on chemical screening of various chemical constituents. The knowledge derived out of which will be of much help during purposeful utilisation of plant specially for the development of steroid industry in the region.