

-: GENERAL

INTRODUCTION :-

The announcement of the dramatic effect of cortisone for the treatment of rheumatoid arthritis followed by the discovery of suppression of ovulation by contraceptive steroids stimulated the use of steroid all over the world during the last few decades (Kendall & Hence, 1949). Thus contraceptive steroids and anti-inflammatory agents (Beta methasone, Dexamethasone etc.) derived from corticosteroids are two major groups of steroids manufactured presently on an industrial scale (Weston, 1976) and necessitated a greater supply of the naturally occurring steroid precursors 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 (Applez Weig, 1962, 1969). Supplies of diosgenin are ultimately limited due to several reasons (Martin, 1972).

A search for alternative raw materials has been motivated by various reasons including the restrictions of diosgenin supply, unwillingness to rely solely on one supplier, and, in many cases, a desire to use internal production to conserve foreign exchange. Solasodine, which is a nitrogen analogue of diosgenin, can effectively serve as a replacement for that material (Mann, 1978).

Moreover, the chemical work done in the last few

decades in solasodine, has been particularly stimulated by the statement of Sato et al. (1951 b) who announced first the chemical transformation of the spiro amine-ketal alkaloid solasodine into three beta - acetoxy pregna - 3, 16 - dien 20 - one. Since the pregnane is important intermediate 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 - dehydro pregnenolone acetate i.e. 16 - DPA with an overall yield (Ca 65%) by a process (Sato et al. 1959; Cekan et al. 1961; Klimova et al. 1968). 16 - DPA gained a considerable industrial significance because of its utilization as a basic substrate 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; Fakh and Hamied, 1964; Djerassi, 1966). Other potentially important synthetic steroids are being derived from solasodine with the help of several novel reactions (Sato and Nagi, 1972; Adam and Schreiber, 1966).

Solanum khasianum Clarke has recently come into prominence as one of the richest sources of solasodine among

the 42 different indigenous solanum species investigated so far in India (Chaudhuri and Rao, 1964; Bahadur and Dayal, 1968; Gadwal, 1977; Kaul and Atal, 1978; Maiti et al. 1979; Kaul and Zutshi, 1982). This plant is amenable 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 wt. basis (Maiti et al. 1964; Saini et al. 1965; Saini and Biswas, 1967; Bakshi and Hamied, 1971; Khanna and Murthi, 1972; Puri and Bhatnagar, 1974; Kaul and Zutshi, 1977). It has been estimated that average 4 metric tons of berries per hectare may yield 0.215 metric tons of solasodine and 400 hectre of lands would be sufficient for the annual production of 54 to 65 metric tons of solasodine, 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 principal components of the plant i.e. solasonine and solamargine, glycosides of solasodine, are effective in dermato-mycosis in animal (Kamyszek, 1974). Moreover, they have significant inhibitory activity on the terminal cancer, sarcoma 180 (Chan et al. 1980) and showed promising results on the patients with skin tumours.

Solanum khasianum Clarke is a common obnoxious sp. growing in and around Darjeeling district. It is obvious, therefore, that research work on the plant from utilitarian point of view will be of much economic value. Though preliminary work on the chemical isolation of glyco-alkaloid was performed by Maiti et al. 1964, 1965, several other authors (Bakshi and Hamied 1971 Chandra et al. 1970; Chaudhuri and Hazarika, 1966; Khanna and Murty 1972) also attempted to study the yield of glycoalkaloid in the fruit of Solanum khasianum Clarke at different places in India. But no systematic study on the yield of glycoalkaloid content has been made in the plants of North Bengal. All these workers have established that the yield of glycoalkaloid was maximum at the yellow stage of the fruit during its development and gradually declines to the maturity of the fruit. But while working on the chemical analyses of the developing fruit it has been noted that some accumulation of solasodine like compounds occurs in the petroleum ether fraction which has been neglected so far by different authors who considered only the methanolic fractions while working on phytochemical analyses. Thus, thorough study on chemical analyses of developing fruits has been considered to be important for better understanding of steroid content in the fruits during its development. Besides steroidal constituents, isolation of phenolic components which has been considered

now-a-days as growth regulators has also been attempted with a view to understanding of their possible physiological role in the plant.

According to Roddick (1974) the steroidal alkaloid like solasodine is a typical or "alcaloide imperfecta". Acetyl COA has been considered to be the starting point of the path way for steroid biosynthesis in plants. As solasodine is a nitrogen analogue of diosgenin, nitrogen is also added into its biogenesis. Thus growth physiology of developing fruits has been studied with special emphasis on the estimation of various biochemical parameters with a view to understanding their metabolic relationship to the alkaloid synthesis in the fruit.

Being a hardy plant, S. khasianum Clarke can thrive well even in marginal lands and compete successfully with competing weeds and other under-growths (Kaul and Zutshi 1982). While surveying the population of S. khasianum Clarke at different places in North Bengal, with special interest on the productivity of the plant, it has been noted that growth performances of the plant varied in different plant association. The earlier stage the growth and development of the plant covers November to February (winter months) when scarcity of water in the soil is predominant due to the lack of rainfall. In nature most of the plants are being died up excepting a few species such as Cannabis sativa, Leucos aspera, Rumex nepalensis and several other minor

species. It has been noted also that the growth performance of Solanum khasianum was better when it grows in combination with the association of Cannabis sativa.

Plant to plant interactions is well known in connection with the ecological study and this aspect has been well reviewed by Whittaker, 1970 and Went, 1970. From the review it appears that most of the plants inhibit the growth of others due to allelopathy, though information in connection with the stimulation of growth of plant due to interaction is rare (Bonner and Greene, 1938, Went, 1957).

Thus study in connection with the growth performance of the plant in various plant associations has also been taken into consideration.

Besides, culture experiments have been set up to study the effect of the edaphic factors on the plant with special reference to its productivity.

The study on seed germination behaviour is important in connection with raising of seedlings required for large scale cultivation but the studies carried out on the germination of seeds in Solanum khasianum Clarke are very limited (Sharma and Varghese, 1980). While utilising this plant commercially at different regions in India, earlier

workers faced much difficulties in connection with its seed germination. Though a few attempt has been made in this aspect (Patil, 1967; Chauhan, 1978; Vicente, 1973; Pingle and Dnyansagar, 1979; Mitra and Kushari 1982), yet the systematic study on the dormancy of seed in this plant is lacking. Moreover, the effect of certain growth regulators and growth hormones in overcoming the dormancy of seed has not yet been studied. Thus, attempts have been made to determine the various factors affecting inhibition and stimulation of seed germination, the information of which will be helpful for raising seedling of the plant in connection with its commercial utilization in the ecological condition of North Bengal.

Acid hydrolysis of glycoalkaloids of Solanum khasianum is the common procedure for the production of solasodine. Inspired by the fact that the decrease of glycoalkaloid content during maturity of fruit followed by subsequent increase of solasodine, the aglycone part of glycoalkaloid, it is expected that the enzymatic activity might be operating in the developing berries for the conversion of glycoalkaloid to the commercially important aglycone part i.e. solasodine. This much consideration has been taken into account on the isolation, purification, activation of enzyme in the fruits of the plant, so that, the enzyme isolated from the fruit may be utilised during

biological hydrolysis of the glycoalkaloid avoiding acid hydrolysis which generally decreases the solasodine content of 30% due to its conversion to diene form (Weston, 1976).

With this background the plant has been studied from chemical and plant physiological point of view so that the information, derived out of the work will be of much help during purposeful utilisation of the plant, specially for the development of steroid industry in the region.