INTRODUCTION
Man's existence on this earth has been made possible because of the vital role played by plant kingdom in sustaining life. Approximately one third of all pharmaceuticals are plant based. If bacteria and fungi are included, over 60% of all pharmaceutical preparations are of plant origin (Sundaresh, 1978). Hence searching the plant kingdom for physiologically active substances is a highly reasonable approach, since the botanical sources for the new drugs are endless. The enormous treasures of knowledge deposited and documented in the Ayurvedic and Unani literature form the life spring of the modern system of medicine.

In spite of the rapid strides made in the frontiers of synthetic medicines, the place of natural drugs obtained from different plants remains unparalleled. This is because of the unwanted side effects of the synthetic drugs, high expenditure involved or due to the complexity in the processes of synthesis. That some of the products like enzymes, cardiac glycosides, antitoxins, anti-hepatotoxic and anti-diabetic drugs from natural sources have to synthetic substitutes, is ample testimony to the significance of plant products in the modern world. Economic considerations and limitations of chemical synthesis of many compounds compelled the modern scientist to turn his attention towards the natural
products in some cases. In certain cases it is economical to allow part of the synthesis to be carried out by the plant in nature and subsequent steps by chemical methods, for example, diosgenin in the synthesis of corticosteroids.

As more and more progress is made in our understanding of the physiological, genetic and biochemical behaviour of plants with respect to various internal and external factors, it becomes imperative to look forward whether these phenomena can be positively exploited to obtain the desired qualities and yield of the chemical constituents from the medicinally important plants. Efforts were made to improve the yields of the active chemical constituents from medicinal plants by treatment with various hormones. Naphthalene acetic acid (NAA) brought about 30-50% increase in the oil yield of Mentha piperita. Indole-3-acetic acid (IAA), NAA, 2,4-dichlorophenoxy acetic acid (2,4-D), Indole pro-pionic acid and Indole butyric acid (IBA) increased the alkaloid production in submerged cultures of some strains of ergot. NAA increased the anthraquinone production in suspension cultures of Morinda citrifolia (Trease and Evans, 1976). Auxins were found to increase the tropane alkaloids in Datura plants by Sinha and Varma (1965) and Shah and Saoji (1967). Gibberellic acid
enhanced the diosgenin content in Dioscorea species (Nandi and Chatterjee, 1978). Improved yield of volatile oil from Hyptis suavelous was noticed by Bhargava and Sinha (1967) with gibberellic acid treatment. This hormone was reported to have brought down alkaloids in Atropa (Ambrosa and Sciuchetti, 1962) and Datura (James and Sciuchetti, 1964) and volatile oil in mint (Ganzelez and Sjarsted, 1960). Sinha and Varma (1970) have, however, observed increase in alkaloid concentration in gibberellic acid treated Datura innoxia plants. Application of nitrate nitrogen increased alkaloid content in Datura by 40% (Ruminaka et al., 1976) and treatment with sodium azide showed significant increase in the diosgenin content of fenugreek seeds (Bhusari et al., 1982).

Incubation experiments with water and various hormones using different diosgenin yielding plant materials resulted in a remarkable improvement in the sapogenin yields (Blunden and Hardman, 1965; Hardman, 1969a; Hardman and Brain, 1971a; Hardman and Brain, 1971c; Hardman and Wood, 1971; Shah et al., 1978; Patel et al., 1981; Selvaraj and Subashchander, 1982).

Vitamin 'C' or ascorbic acid which is universally present in all the plants was shown to act like auxins (Chinoy et al., 1957; Garg et al., 1958; Grover et al.,
1958; Khudairi, 1968) and hence was considered to be a 'Photophytohormone' by Khudairi (1968). Basing on their experimental findings Chinoy et al., (1965), Michniewicz (1960), Brugowitzky and Popovici (1966) suggested that the effect of gibberellic acid is manifested through the new synthesis of ascorbic acid. Ascorbic acid was found to be more effective in enzyme mobilization than gibberellic acid (Saxena et al., 1969). It was shown to be more efficient in molecular nitrogen fixation (Koch et al., 1967), in increasing the total nitrogen content of the plants (Swaraj and Garg, 1969) and branching in cotton plants (Gurbaksh Singh and Garg, 1969) as compared to gibberellic acid. Ascorbic acid treatment increased the growth and yield of cumin (Chinoy et al., 1975).

Ascorbic acid was reported to act through the formation of free radicals which complex with proteins, nucleic acids and cause biological semi-conduction and energy transfer hereby accelerating various metabolic activities (Chinoy, 1970). It was found to derepress the DNA by removing histones, thus paving the way for the new synthesis of RNA and new structural and enzymatic proteins (Price, 1966; Schopf, 1967; Fellenberg, 1969). Pretreatment with ascorbic acid stimulated germination, water absorbing capacity, resistance against the atmospheric drought and vigorous growth in a
number of cultivars of wheat, oat, barley and other crop plants (Chinoy and Saxena, 1978). But no systematic approach was made so far to study the influence of ascorbic acid on the secondary metabolites of the medicinal plants. Incorporation of ascorbic acid in tissue culture media resulted in an enhancement of the pyrethrine content in Tagetus erecta (Khanna and Khanna, 1976), tropane alkaloids of Atropa belladonna (Sharma, 1977) and opium alkaloids in Papaver somniferum (Khanna, 1978). Hence it was thought worthwhile to study the effect of ascorbic acid on the secondary metabolites of some important medicinal plants. For this purpose we selected Anethum sowa, Trigonella foenum-graecum, Adhatoda vasica and Datura innoxia. The seeds were given presowing treatment and then germinated in the experimental plots. Growth data and content of the active principles at different stages were studied in these plants.

Anethum sowa:

*Anethum sowa* is an Umbelliferous herb used as a vegetable and for culinary purposes. It is used as a carminative, stomachic, aromatic stimulant and effective as an anthelmintic. *Anethum sowa* differs from its European counterpart, *Anethum graveolens* in that it contains dillapiole, a toxic and undesirable constituent (Guenther, 1953). Adhikari (1965) described the diffe-
rences in the morphology of Anethum graveolens and Anethum sowa. Basles and Gupta (1971) reported that dillapiole is present in the herb oil of Anethum graveolens and absent in the oil of the fruits while it is absent in the herb oil of Anethum sowa and present in the fruit oil. The dillapiole percentage was also differently reported by various workers (Chakravarty and Bhattacharya, 1954; Adhikari, 1965; Shah et al., 1971a; 1971b; Miyazawa and Kamiooka, 1974; Asharaf et al., 1977; Lawrence, 1980). It was reported that carvone content increased from every low amounts starting with fertilized carpel to the maximum amount in the developing fruits (Kalitzki, 1954; Kapoor and Abrol, 1961; Betts, 1965). Carvone, an oxygenated terpene, is a major component of dill oil and is also reported to be present in oil obtained from this herb (Guenther, 1953). Malaviya and Dutt (1940) have, however, reported that herb oil before flowering contained mainly phellandrene but no carvone. Reasons for presence or absence of carvone in herb oil from different varieties of dill are not properly understood. Further, the origin of carvone from limonene as postulated by Loomis (1967) deserves verification in the light of the investigations by Schantz and Muhtikangas (1971) and Akhila et al. (1980), who stated that carvone might not be derived from limonene. We planned to investigate into these
aspects through studying the complete ontogenic variation of different components of volatile oil separately in various parts of plants derived from two varieties of *Anethum sowa*.

Excepting one report by Kaul and Kapoor (1962) on the effect of gibberellic acid on the volatile oils of *Anethum graveolens*, hormonal effect on the oils of this plant have so far not been investigated to any considerable extent. Keeping in view the above observations and the involvement of ascorbic acid in oxidation-reduction processes, electron transfer and gene derepression, we felt it necessary to undertake the study of ascorbic acid effect on dark and pale varieties of Indian dill described by Shah et al. (1975).

**Trigonella foenum-graecum** :-

*Trigonella foenum-graecum* is a household spice generally used in perfumery, pickles, condiments and preparations of vegetables. It mainly contains a steroidal saponin, dioscin, which is an important starting material for the synthesis of corticosteroids, sex hormones, anabolic agents and oral contraceptives (Hardman, 1969a). The percentage of diosgenin, a sapogenin of dioscin, has been differently reported by various workers in fenugreek seeds (Fazli and Hardman, 1971; Bakshi and Hamied, 1971; Puri et al., 1976). Kopadia (1975) studied
the ontogenetic variation of diosgenin in *Trigonella foenum-graecum*. Patel (1977) reported that the endosperm in the germinating seeds of fenugreek contained the minimum amount of diosgenin whereas the cotyledons possessed the highest concentration of 2.028%. He further noted that germination of the seeds was associated with enrichment of diosgenin content. A 35% increase in the diosgenin content of fenugreek seeds incubated with different hormones was reported by Hardman and Brain (1971a). Incubation of the seeds with ascorbic acid exhibited an increment of 16.5% in diosgenin yield (Bhavsar et al., 1980). But no report is seen regarding any influence of ascorbic acid on the ontogenetic variation of diosgenin in fenugreek. Hence this plant was selected for studying the effect of ascorbic acid on the diosgenin content at different stages.

*Adhatoda vasica* :

*Adhatoda vasica* is an important medicinal plant used in the Indian traditional medicine for the treatment of asthma, inflammation of the respiratory tract and as antispasmodic (Kirtikar and Basu, 1975). This plant contains the quinazoline alkaloids, vasicine being the major one (Hooper, 1888). Amin and Mehta (1959) reported another important alkaloid known as vasicinone. Vasicinone is a bronchodilator, effective in the treatment of
asthma and coughs (Amin, 1961). Vasicine, when given orally, gets converted into vasicinone and acts as an expectorant (Atal, 1980). But when it is given parenterally, it acts as a good uterotonic and abortifacient (Gupta et al., 1977; 1978). Many newer alkaloids have been isolated by the team of Atal at R.R.L., Jammu (Atal, 1980). The alkaloid content and seasonal variation in vasaka were worked out by Pandita et al. (1983). They reported that the plants contain the highest amount of alkaloids in the months of August and October and the minimum in March. So far no attempt has been made to study the effect of any plant hormone or chemical substance on the alkaloid content of this plant. Hence we thought it interesting to study the effect of foliar spray treatment of ascorbic acid on the alkaloid content and seasonal variation in vasaka plants raised from stem cuttings. Datta and Samanta (1974) reported nine cytotypes in vasaka. In our Pharmacognosy garden we found two different types of vasaka plants, very remarkably differing in the height of the plant and appearance and size of the leaves. Hence we carried out preliminary cytological, histochemical, microscopic and pharmacognostic studies in both the varieties. Also the effect of ascorbic acid was studied on the leaf and root alkaloids of both the plants for one year.
Datura innoxia:

Datura innoxia, which belongs to the family Solana-ceae contains the tropane alkaloids of which hyoscyamine and hyoscine are the major ones. The plant has been in use in Unani and Ayurvedic systems of medicines since a very long time. The whole plant is toxic, narcotic, aphrodisiac, applied topically to remove the pain of tumours and piles (Kirtikar and Basu, 1975). Hyoscine, hyoscyamine and its racemic form atropine are used as sedatives, antispasmodic and mydriatic agents. Hyoscine, in the form of its salts is mainly used as preanaesthetic in surgery and child birth and in prevention of motion sickness (Atal and Kapur, 1982). Prabhakar et al. (1971) have surveyed the possibilities of exploiting Datura innoxia for commercial purposes. The total alkaloid content and the major alkaloidal constituent in different parts of the plants from different localities were variously reported (Wealth of India, 1952, Khanna, 1965; Evans, 1966; Griffin, 1966; Prabhakar et al., 1971; Sarin, 1982) in which the total alkaloid in the leaves ranged from 0.064 to 0.564%, in roots from 0.39 to 0.61%, in stems from 0.3 to 0.5%, in seeds from 0.14 to 0.44%. Evans (1966) reported that scopolamine is the major alkaloid in the aerial parts whereas Griffin (1966) found hyoscyamine to be the major alkaloid in the roots.
Serin (1982) reported that hyoscine is the major alkaloid in the herb and hyoscyamine in the seeds. Verzar-Petri (1965) gave detailed ontogenic variation of these alkaloids in *Datura innoxia* and *Datura metel*. The total alkaloid content and the major individual constituent of locally available *Datura* plants are important from commercial viewpoint. Hence we decided to grow the *Datura innoxia* plants in two different seasons from the same stock of seeds and analyse the total alkaloids, hyoscyamine and hyoscine from leaves, stem, roots, pericarp and seeds at various growth stages.

Extensive work has been done by many people on the effect of plant growth hormones, different chemical fertilizers, aminoacids and light on the alkaloids of *Datura innoxia* (Sinha and Varma, 1965; 1966; 1968; El-Hamidi et al., 1966; Shah and Saoji, 1967, Khanna and Nag, 1972; French and Gibson, 1957, Cossen, 1966).

Rowland and Gibson (1966) observed that ascorbic acid oxidase activity was not involved in the alkaloid biosynthesis in *Datura innoxia*, whereas Sharma (1977) reported that ascorbic acid promoted the synthesis of tropane alkaloids in *Atropa belladonna* tissue cultures. Hence the seeds of *Datura innoxia* were pretreated with ascorbic acid, germinated and foliar application of the
vitamin continued at fortnightly intervals. The effects of the treatment were studied on the growth, total alkaloids content, percentage of hyoscyamine and hyoscine in leaves, stem, roots, pericarp and seeds at various growth stages.