Ontogeny or developmental cycle begins with the fertilization of the egg cell and the appearance of primordia in the generative organs of the parent plant and ends with senescence and death. Ontogeny treats the cause and origin of form. It is a field where different disciplines such as morphology, physiology, embryology and genetics converge: Biochemistry and biophysics have their important roles too in the elucidation of these developmental problems. It is a series of correlations in which structures and various physiological reactions are tied together in diverse ways. For example, vegetative development is basically similar in its dependence upon growth and differentiation. Many external as well as internal factors such as light, temperature, hormones etc. have a direct bearing on the ontogeny of the plant. Thus developmental physiology like every other science can only be a causal inquiry. Its task is to analyse the complex of developmental pathways into causal chains and then to investigate their interrelations in the total mechanism.

A profound change in the form of differentiation concerned with flowering warrants a study of the various
aspects of metabolism underlying the phenomenon viz. physiological, physiogenetical, biochemical and cytochemical (histochemical). These studies have been adequately reviewed elsewhere (Bonner, 1959; Chailakhyan, 1961, 1968; Chinoy, 1962, 1966; Heslop-Harrison, 1967; Nougarede, 1967; Schwabe, 1969; Evans, 1969; Bernier et al., 1967). A number of workers have studied the effect of factors like nutrition, day length, light intensity, temperature, growth period and others on growth and differentiation of the vegetative and the reproductive shoot apex (Chinoy and Nanda, 1946, 1951; Chinoy, 1947; Gott, Gregory and Purvis, 1955; Kuperman et al., 1915; Ryle and Langer, 1963, 1963a; Garg and Chinoy, 1964; Mansuri, 1965; Vora, 1969; Shah, 1972; Ghesani, 1972; Shah, 1973).

In spite of this, very little is known about the impact of various controlling factors at the cellular level, although recently some beginning has been made in this direction with the help of histochemical techniques. It elucidates the nature of the early changes at the shoot apex during flower induction (Evans, 1969). It also pinpoints the site of a particular reaction at a cellular level which are not revealed by biochemical methods.

Much work on the effect of temperature on growth and development refers only to effects of low temperature:
freezing or just above freezing and vernalization. Only a few studies have been undertaken to study the effect of high temperature above 35°C. The range of temperature which a seed can tolerate has been from 45°C to 57°C as shown by Altman and Dittmer, 1966. These studies are confined only to temperature range from 25°C-35°C because the protoplasm can tolerate this range.

In a tropical country, the plants, especially cereals during their grain formation stage are subjected to atmospheric temperature stress. The high temperature prevents proper grain filling; even in monsoon, for cereals during ripening time, high temperature also impedes grain filling. The cereal seeds from their very birth or formation are thus naturally heat treated like the seeds of temperate region which are naturally cold or low temperature treated. It would be therefore profitable to investigate the germinative and postgerminative behaviour of seeds in this region when treated with temperature much higher than the tolerance range of protoplasm. Thus it was considered of interest to investigate the biochemical and histochemical changes taking place in the seeds during germination and metabolic events as influenced by different temperature treatments. Generally temperature extreme above and below the optima leads to some disorders in the metabolic
activities of plants. It is thus important to understand the normal temperature mechanism and why its deviation causes plant disorders. In fact, all physiological processes are directly or indirectly influenced by temperature. Only when the heat energy level is about 20° to 45°C, biochemical reaction can proceed normally. The higher the temperature, the rapid is the denaturation. Besides this, the optimum absorption of water generally takes place above 30°C, while high temperature is conducive to rapid water loss.

The phases of cell division of the shoot apex, differentiation, leaf production and expansion seem to respond differently to temperature. Besides this, temperature affects the hormonal mechanism of flowering through the control of the rate of synthesis or the destruction of metabolites. The rate of translocation from leaves to the meristem affects the hormones in inducing morphogenic changes in the meristems (Shah, 1973).

Some plants need low temperature (Celery, beet, onion, cabbage, carrot, cosmos, sugarbeet etc) while others require a higher temperature for flowering (Cleome). The deleterious effect of high temperature is observed by decreased fresh and dry weight, proteins and nucleic acids are also denatured. However, there are known
instances of seed retaining their full viability even after undergoing heating above 140°C (Gain, 1922). Although at such a high temperature, protoplastic and other proteins would be denatured and coagulated and yet germination could be obtained. This raises doubt regarding the temperature coefficient for the protein coagability (Hare, 1961; Stokes, 1965). The favourable effect due to hot air heating and thermal treatment are the increased viability, rate of germination, productivity of seeds and in the case of vernalised seed material, increased quality of seed, seed vigour, germination, rate and viability (Vorob'ev, 1915; Tyuvin, 1938; Tyuvin, 1939; Stokes, 1965; Leopold, 1964). Dry seeds of some plants have been known to tolerate a brief exposure to high temperature (Burgess, 1919; Crosier, 1956). Crosier et al. (1962) and Uhlinger (1970) reported enhanced germination of oats and rye following exposure to dry heat. Various growth regulators influence profoundly the developmental processes but their universal presence and exact course of action in a living system is yet to be understood. On the contrary, recent work in this laboratory (see Chinoy, 1962, 1968) has highlighted the importance of ascorbic acid metabolism in growth and development of plants because of its universal presence. The production and utilization of ascorbic acid at enhanced level produces a highly activated
metabolic state in the shoot apex at the time of floral induction as well as subsequently in the developing spike during the period of reproductive differentiation. Chinoy (1967a, b) has stressed the importance of the free radical of ascorbic acid in the process of flowering. Work done in this laboratory has given conclusive evidence on the importance of ascorbic acid and shown that many vital processes are profoundly influenced by the presence of ascorbic acid in each and every organ of the plant (Chinoy, 1962, 1967, 1968, 1969; Chinoy et al., 1969, 1970, 1970a, 1970b). Besides ascorbic acid, soluble -SH groups and glutathione considerably affect the redox balance of the cell. This -SH group protects ascorbic acid from oxidation (Barron, 1951).

To investigate the effect of thermal stress, the following experiments were carried out for evaluating the effect of temperature pretreatment:

In this experimental work seeds were treated with 70°G (gradual heating) and 70°D (direct heating) temperature pretreatment.

Experiment I: Effect of temperature pretreatment on some biochemical changes during germination.
Experiment II: Comparative studies on the effect of temperature treatment ($70^\circ$G and $70^\circ$D) on biochemical changes during various phases of growth, reproductive differentiation, seed development and maturation of plants.

Experiment III: Histochemical localization of ascorbic acid (AA), nucleic acids (RNA and DNA), histone and ascorbic acid free radical (AA-FR-peroxidase) enzyme during the differentiation of shoot apices of plants raised from $70^\circ$G temperature treated seeds and untreated seeds.