ONTRODUCTION

Ontogeny or developmental cycle of the plant begins with the fertilization of the egg-cell or with the appearance of primordia in the generative organs and tissues of the parent plant, and ends with senescence and death of the plant. Ontogeny, which treats the cause and origin of form, is a field where different disciplines such as morphology, physiology, embryology and genetics meet. Biochemistry and biophysics also have played their important roles in the elucidation of the ontogenetical problems.

Plant ontogeny may be looked upon as a series of correlations in which structures, activities and various physiological reactions are tied together in many ways. For example, vegetative development is basically similar in its dependence upon growth and differentiation. A major correlation is that between growth and development. Many external as well as internal factors such as light, temperature, hormones, etc., have a direct bearing on the ontogeny of the plant.

With the elucidation of new facts there arose corresponding theoretical generalization as follows: Klebs (1918) was a pioneer of theoretical generalizations in this subject. He postulated three ontogenetic phases viz., Ripe-to-flower condition, which was not accompanied by any morphological change in the shoot apex; (b) the formation of flower primordia; and (c) actual formation of inflorescence and floral parts.
Gassner's concept of the development of winter forms was also put forward at the same time Garner and Allard (1920-1923) developed the concept of photoperiodism in plants. Lysenko's (1935) conception on the development of seed plants by stages, the hormonal theory of tropisms and growth of plants (Cholodny, 1927; and Went, 1928) and the conception of the hormonal nature of the developmental process propounded by Chailakhyan (1937) are also contributions towards the elucidation of this important problem.

All these generalizations serve as the basis for new advances in the knowledge of ontogeny. However, none of them elucidate ontogeny in all its intricate and varying aspects.

In spite of this it is generally agreed that in order to complete sexual reproduction, a plant must necessarily pass through various developmental phases and one or more of these phases, may be purely physiological in nature without any visible morphological manifestation. It has also been accepted that of the varied external environmental factors, temperature and light seem to have far-reaching effects upon the developmental ontogeny of the plant. Chinoy (1956) has actually worked out a quantitative relationship between light and temperature requirement and development of a plant.

The change of the shoot apex from the vegetative state to the reproductive state of development is probably the most profound ontogenetic change in plants. A number of workers have
studied the effect of factors like nutrition, day length, light intensity, temperature, growth period and others on the differentiation and growth of vegetative and reproductive parts from the shoot apex (Chinoy and Nanda, 1946, 1950, 1951; Chinoy, 1947, 1949, 1950; Gott, Gregory and Purvis, 1955; Kuperman et al., 1955; Ryle, 1961; Ryle and Langer, 1963, 1963a; Garg and Chinoy, 1964). Inspite 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. Steward (1961) considers a study of the influence of flower inducing factors like light, temperature, hormones, etc., on the shoot apex as very important because it is the seat of inception of all subsequent growth and differentiation in the shoot.

Wardlaw (1961) suggested that the development of a succession of distinctive floral organs may be having relationship to the changing metabolism of the shoot apex. Surgical and cultural experiments on floral splices lend some evidence in support of this view. Cusick's (1956) experiments with Primula bulleyana have produced results to support the hypothesis that developing floral apex passes through a succession of physiological states that regulate the formation of each kind of organ in turn.

The evidence for the role of auxins and florigen in growth and flowering is controversial (Galston and Purves, 1960; Chailakhyan, 1961; Thimann, 1963). Recently the role of ascorbic
acid as a regulator of growth and development has also been established (Held, 1937, 1938, 1941, 1941a, 1941b, 1943; Chinoy, Grover and Sirohi, 1957a; Garg, Chinoy and Nanda, 1953; Chinoy and Nanda, 1959; Chinoy, 1962). Recent evidences also suggest the role of nucleic acid metabolism in the ultimate control of flowering (Kessler, B., Bak, R. and Coben, A., 1959; Butenko, R.G. and Chailakhyan, M.Kh., 1962; Chailakhyan, M.Kh. and Khlopenkova, L.P., 1962; Chinoy, 1962, 1964).

The present work on two varieties of barley is divided into the following four categories:

(1) Relationship between growth and development.

(2) Study of the shoot apex in relation to growth and differentiation of vegetative and reproductive organs.

(3) Energy requirement for growth and development.

(4) Ascorbic acid metabolism and DNA level in relation to growth, differentiation and flowering.