INTRODUCTION

Survival, the persistence of life, through its durability, its adaptability, its capacity for growth and its reproduction is a basic and universal characteristic of life. Reproduction helps life to survive. It maintains the continuity of life. Plants survive by adapting and growing in response to their changing environments. Spermatophytes reproduce sexually by producing flowers. And other plant groups also reproduce by sexual methods. Almost any species can be studied in detail to understand its responses to changing temperatures, light etc.

Researchers have, since time immemorial, made attempts at understanding the responses of plants to changing light and temperature. Pioneering work by Bailey (1893), Journols (1914) and Klebs (1918) led to the realisation of the role of light in the process of flower development. Klippert (1957) suggested applications of low temperature treatment or vernalization in agriculture for early floral development. Gassner (1918) also described the induction of floral primordia by low temperatures.

The phasic theory of development by Lysenko (1935) the hormonal theory of tropism and growth by Cholodny (1927) and Lent (1928) as well as the concept of normal nature of the developmental process of Chailakhyan (1937) are noteworthy contributions that have led us to the understanding of the process of flowering.

Floral initiation on an otherwise vegetative shoot apex is one of the most important and interesting ontogenetic changes in
the life of any plant. It is a change influenced by lots of factors, both intrinsic and extrinsic. Intrinsic or internal factors, like hormones, nutrition, genetic factors and extrinsic or external factors like daylength, light intensity, temperature, humidity, soil conditions and growth period are some of the many factors affecting growth and development. Little is known as to how these factors influence the floral initiation at cellular level. It is hypothesised, that there is an accumulation of metabolites which may be proteins or hormones that influence floral induction in plants. Chinoi (1967) suggested the role of free radicals and charge transfer complex in the molecular and submolecular events in floral induction and differentiation.

The advances in this field are very rapid, and although there is a great biological diversity some underlying uniformities are becoming apparent. Yet, there is much left to learn about the intricacies of the flowering process.

The present work is also an attempt to study the developmental aspects of one of the very important tuberous plants of our country i.e. carrot. There appears to be different views as far as the origin of carrot is concerned. According to Hill (1952) carrot has been cultivated for over 2000 years. It was known to the Greeks and Romans and reached Europe early in the Christian era. It was a favourite vegetable in England in the time of Queen Elizabeth, and was brought to Virginia in 1609 and New England in 1629. The Indians carried it over to the rest of America. It has been listed as an old
world species. Chaudhury (1967) explains the origin of carrot in Central Asia in the hills of Punjab and Kashmir with a secondary centre of distribution in Asia, Europe and North America around the Mediterranean. Today, carrots are grown all over the world. It belongs to the family Urticaceae, genus Daucus and species *carota*. The numerous varieties of carrots differ in size, shape, colour and quality and are correlated with differences in the soil. Carrot varieties can be grouped into two European and Asiatic types. The European types like Early Hales are biennial while the Asiatic types are annuals. Very little work has been done to improve the Asiatic types. cv. Pusa Kesari, originally a cross between two groups, has been selected to behave like the Asiatic types. The Asiatic types have more anthocyanin pigments and less carotene and hence, may be less nutritive. The European varieties are orange coloured, cylindrical and coreless. They are also, said to be of the highest quality (Chaudhury, 1967).

The Asiatic types produce seeds in the plains of India. The European types produce seeds only in the hills. It is a cross pollinated crop. Honey bees are the main pollinators. The inflorescence is a compound umbel, normally called a head. There is a single central or primary head. Flowers usually begin opening on the periphery of the central head first. Porthwick et al. (1931) have studied the floral development in *Daucus carota* in detail. According to them, about eight days
later the process starts in one or more of the secondary heads. The time required for the entire umbel to pass through the flowering period is about 7-10 days. More quantity of seeds are produced when roots are left in situ. However, for quality seed production the roots should be dug out, selected and then transplanted.

Carrot is grown all over India and is used for human consumption as well as for forage particularly for feeding horses. Carrot is one of the rich sources of β-carotene which indirectly enriches the plant with its vitamin A value. Vitamin A deficiency leads to night blindness and in extreme cases to xerophthalmia. Children are the worst sufferers. Carrot has a unique distinction of being the first plant successfully used in plant tissue culture experiments by Steur and al. (1963) but still, the fact is, that carrot is being grown only from seeds. Hence, it is logical that the flowering of carrot becomes of utmost importance and interest, being a biennial cv. Early banties would normally flower in the second growing season. And it is not possible to obtain flowers under normal environmental conditions in the plains of India because of its noncongenial growing conditions.

Then, is it possible to make cv. Early banties flower in the same season, i.e. to transform it from a biennial cultivar to an annual cultivar?

We know that gibberellins have been shown to convert biennial long day plants and cold requiring rosettes into
Can gibberellic acid cause induction and claim to be the flowering hormone in case of Daucus carota cv. Early Rantes?

Normally, carrot would undergo natural chilling in the winter. Can we artificially overcome this long winter spell?

cv. Early Rantes is a European variety and naturally is not suited for the hot weather on the plains of India. But still, can we modify the environment for this variety so as to make it flower?

Can we increase the yield both in terms of root weight and seed number by treating the plant with appropriate chemicals?

Can we improve its carotene content, so that its vitamin-A value can be increased?

These were some of the objectives that led to the experimental part that follows.