SUMMARY

The present work was undertaken to study the following aspects of growth and development in *Cicer arietinum* Cv. Chafa as affected by photoperiodic treatments:

(1) Effect of photoperiodic treatments (SD, ND and LD) on flowering and metabolic events like ascorbic acid turnover, biosynthesis of Nucleic acids (DNA and RNA), Proteins and Histones as well as activities of related enzymes like, Peroxidase, AA-FR-peroxidase, RNase and protease during growth and development.

(2) Effect of different photoperiods on growth characters like: height, leaf number, branch number and branch leaf number, fresh and dry weight of root, stem, leaf and whole plant as well as growth period and ripening period.

Experiment - I

Seeds of *Cicer arietinum* Cv. Chafa were sown in earthenware pots (9" diameter). Watering was done daily and manuring of ammonium sulphate and superphosphate (2:1) was given weekly at a rate of 1 gram per pot. Photoperiodic
treatment was started when the seedlings had become well rooted. The treatment consisted of (1) Normal day (ND) - 12.5 hours of natural day-light; (2) Short day (SD) having 8 hours of natural day-light and 16 hours of darkness and (3) Long day (LD) - Natural day light supplemented by artificial fluorescent tube-lights at night (having mean light intensity of 42 ft. C.).

Levels of ascorbic acid (AA), ascorbigen (ASG), ascorbic acid utilization (AAU), AA-MM-complexing (AA-MM-complex), nucleic acids and proteins as well as activities of enzymes like general peroxidase, AA-FR-peroxidase, protease and RNase were determined at various stages of growth, development and seed maturation. Terminal apex and their corresponding leaves were analysed in SD, ND and LD during the whole life cycle of plant and different reproductive organs and their corresponding leaves were also analysed in all the three photoperiods. The higher rate of synthesis of AA, nucleic acids and protein and their utilization under LD, ND and SD respectively during their developmental stages suggest that the above cited metabolites participate directly in physiological processes leading to differentiation - Simultaneously AA-FR-peroxidase activity also increases accelerating the formation of free-radical of AA which activates many enzymic systems like protease and RNase causing faster mobilization of important
constituents for rapid development. ASG content decreases resulting in release of more AA which is rapidly used for active cell-division and differentiation. All these enzymic and metabolic processes are hastened under LD followed by ND and SD creating an actively energised atmosphere resulting in early flowering under LD. Similar enhancement of metabolic processes is maintained in the shoot apex of LD, ND and SD respectively.

Experiment - II

Growth in terms of height of the main stem, number of leaves and branches was recorded under all the three photoperiods for 10 plants at weekly intervals. By the method of random sampling, three plants from each treatment were selected for separately recording fresh and dry weights of root, stem and leaf at weekly intervals. Relative growth rate (RGR), net assimilation rate (NAR) and leaf weight ratio (LWR) were also worked out. Flowering data and harvest data were also recorded.

A study of all the above mentioned characters as affected by long photoperiod indicate that floral-initiation is hastened as a consequence there is less branching and leaf production under LD treatment as compared with ND and SD. The different stages of reproductive differentiation and grain development as well as maturation
are reached earlier as a result of long photoperiod. Even the values of RGR for different characters are maintained at higher level in Long Photoperiod. The 1000 kernel weight is much higher in long photoperiod than Normal and Short Photoperiods.

Finally it can be said that this work on *Cicer arietinum* Cv. Chafa confirmes the ascorbic acid - nucleic acid - protein metabolism concept of growth and development which was advanced earlier from this laboratory in case of wheat, barley and other thermophobes.