SUMMARY

Chapter 2

The effect of exposure of pullets, to a changing photoperioc from LD 18:6 (long photoperiod;LP) to LD 12:12 (NLD), on the first and second cycles of egg laying were studied in the Indian RIR breed of domestic fowl. Birds were reared under LP from day 1 till day 90 post-hatch, and thereafter maintained under a photoperiod of NLD as compared tc birds reared continuously under NLD. There was a delay in initiation and an early termination, of egg laying in LP hens (NLD Vs LP; 178 Vs 206, and 352 Vs 306 days respectively) with lesser number of eggs (168 Vs 156 eggs/hen). However, the LP hens laid heavier eggs than NLD hens (40.6 Vs 47.8gms) and showed an overall better rate of lay (0.47 Vs 0.51 eggs/hen/day). Birds of 72 weeks of age maintained under LP for 30 days showed a poor egg laying performance. Overall, it can be concluded that a step-down photoperiod has no significant effect on the laying performance but has a favourable effect on the average egg weight and rate of lay.

Chapter 3

One day old pullets of Indian RIR breed were subjected to mild hypercorticalism (HPR) or hypocorticalism (HPO) (from day 1 to day 90) and maintained under a constant photoperiod of LD 12:12 (NLD) to study its effect on the first and second cycles of egg laying. The results were compared with the egg laying performance of pullets reared under NLD

throughout. The HPR hens showed an early initiation of egg laying by 2 days (NLD Vs HPR; 178 Vs 176 days) and, an delay in termination by 4 days (530 Vs 534 days). Whereas, the HPO hens showed a delay in initiation and an early termination (178 Vs 180 days) and an early termination (530 Vs 526 days). The NLD and HPR hens laid almost similar number of eggs (168 vs 171) while the, HPO hens laid significantly lesser number of eggs. Adult hens towards the end of their egg laying (72 weeks) subjected to either HPR or HPO for 30 days, resulting in 15% more egg yield in the former and 22% less yield in the latter compared to NLD hens. These results provide suggestive evidences for influence of altered corticosterone levels in growing pullets and adult hens on egg laying performance.

Chapter 4

The effect of mild hypercorticalism (HPR) or hypocorticalism (HPO) in pullets under changing photoperiod from LD 18:6 (long photoperiod; LP from day1 to day 90) to LD 12:12 (NLD), on the first and second cycles of egg laying were studied in the Indian RIR breed of domestic fowl. The HPR hens showed a longer egg laying cycle with an early initiation (LP vs HPR; 206 vs 193 days) and delayed termination (512 vs 555 days), while the HPO hens showed a shortened cycle with an early initiation (206 vs 130 days) and early termination (512 vs 418 days). Both HPR and HPO hens laid more number of eggs (181 and 161eggs/hen respectively) as compared to the NLD hens (156 eggs/hen). Whereas, the average egg weight was slightly higher in the HPO group, that of HPR was same as that of controls. Adult birds of 72 weeks age subjected to the above experimental schedule for 30 days, exhibited poor egg laying under HPR and HPO conditions as compared to the controls. Overall, the results indicate a definite favourable influence of both HPR and HPO on egg

laying performance, with HPO being economically more feasible an approach due to the lesser maintenance cost.

Chapter 5

One day old pullets of Indian RIR breed were reared under LD 12:12 (NLD throughout, or under a step down photic schedule of LD 18:6 (long photoperiod; LP; from day 1 to day 90) followed by LD 12:12. The effect of these photoperiodic schedules on physical features and biochemical composition of eggs has been assessed. The LP hens laid marginally heavier eggs compared to the NLD hens. The eggs of LP hens showed higher weights of yolk and albumen and a lower yolk : albumen ratio. on a temporal scale, the percentage water content of yolk and solid content of albumen showed a reverse trend between the NLD and LP eggs. The total protein and total cholesterol contents were significantly increased in both yolk and albumen of LP eggs while the carbohydrate and total lipid contents decreased in yolk and albumen respectively. A comparison of calorific value shows significantly greater energy content (13.4%) in LP eggs. Overall, the present evaluations provide hitherto unreported evidence of a step down photoperiodic schedule on the structure and composition of eggs and their nutritional status.

Chapter 6

Pullets of RIR breed were subjected to mild hypercorticalism (HPR) or hypocorticalism (HPO) during their growth phase (day1 to day 90) and reared under a constant photoperiod of LD 12:12 (NLD), to assess the possible effects on physical features and biochemical composition of their eggs. The egg and albumen weights in HPR and HPO birds were decreased compared to those of NLD birds. The lipid content of yolk and the protein content of albumen of HPR and HPO eggs were increased.

The cholesterol content showed an increment in yolk and a significant decrement in albumen of HPR and HPO eggs. The calorific value per 100 gm edible egg was 14% more in HPO eggs. These results indicate that functional alterations in adrenocortical activity during pullet the stage have definite influence on composition of eggs by inducing sutle changes in the metabolic features of liver and oviduct.

Chapter 7

Influence of mild hypercorticalism (HPR) or hypocorticalism (HPO) on RIR pullets reared under a long photoperiod (LD 18:6; LP;from day 1 to day 90) has been to assess the possible changes in composition of this hens, as compared to eggs of hens reared under LP alone. The physical features of HPR or HPO eggs did not show any significant change in most of the parameters, except for reduced shell thickness, egg height and volume in HPO eggs. The overall biochemical composition of HPR eggs showed slightly reduced protein and increased cholesterol in albumen and, increased yolk glucid content. The HPO eggs showed increased albumen protein, lipid and cholesterol contents and decreased yolk protein content. The calorific values of HPR and HPO eggs were similar to that of LP eggs. Overall, these results suggest certain effects of altered adrenocortical status under LP on the biochemical composition of eggs by subtly altering the metabolic homeostasis of liver and oviduct.

Chapter 8

The pullets of Indian RIR breed of domestic fowl were reared under a step-down photoperiod of LD 18:6 (long photoperiod; LP) from day 1 to day 90 post-hatch, and then shifted to LD 12:12 (NLD), to assess its effect on lymphoid and reproductive organs, histomorphology and serum hormone profile. The observations were made at 30, 60 and 90 days and, the

results were compared with pullets reared under NLD alone. The weights of thyroid and ovary showed significant increment in LP chicks, whereas the weights of liver and lymphoid organs were identical to that of NLD chicks. The weights of adrenal and oviduct were significantly lower. In general, the serum levels of T_3, T_4, corticosterone and progesterone tended to show a gradual decrement with age in NLD chicks. but the LP chicks showed a differential change marked by higher T_3 and T_4 levels throughout and, increased corticosterone and decreased progesterone levels at 30 and 60 days. Long photoperiod seems to have an initial depressive, but later stimulatory effect on growth of thyroid, while adrenal showed reciprocal set of changes. The histometric data suggests a stimulatory effect of light, indicated by increased number of follicles and decreased degree of follicular atresia. Overall, it can be concluded from the present observations that, exposure of chicks to LP has differential effects on growth kinetics and, a definite favourable influence on HHG axis suggesting inherent photosensitivity and, no setting in of photorefractoriness during this period.

Chapter 9

The pullets of Indian RIR breed of domestic fowl were subjected to mild hypercorticalism (HPR) or hypocorticalism (HPO) and reared under a long photoperiod of LD 18:6 during the post-hatch development (day 1 to day 90). Its effect on the histomorphology of endocrine and reproductive organs and serum hormone profile has been assessed. The absolute and relative weights of thyroid, adrenal, ovary oviduct, liver and lymphoid organs (spleen, thymus and bursa) were, in general higher in HPR and HPO chicks, as compared to the NLD chicks. The relative weight and growth indices of liver and lymphoid organs were higher in HPR and lower

in HPO chicks. The serum levels of T_3, T_4 and progesterone showed relatively lower levels of hormones in HPR chicks as compared to NLD chicks. The histoarchitecture of thyroid of HPR and HPO chicks, showed increased and moderate colloid retention respectively, with reduced follicular cell height. The adrenal showed prominent cortical cords and a mixture of active and inactive cells in HPR and HPO chicks, with HPO chicks showing relatively more secretory exhaustion. The histometry of ovarian follicles of HPO chicks showed a retarded rate of transition into higher sized follicular hierarchy. These results suggest some negative influence of HPR on ovarian functions, and further, a possible relationship of adrenal steroids and ovarian functions during growing phases in RIR pullets.

Chapter 10

Day old pullets of the Indian RIR breed of domestic fowl were subjected to mild hypercorticalism (HPR) or hypocorticalism (HPO) and reared under a long photoperiod of LD 18:6 for the first trimester of post-hatch development. The body weights of HPR and HPO chicks were similar to LP chicks at 90 days. The organ weights and growth kinetic ratios of thyroid, adrenal and ovary were significantly greater in HPR chicks compared to LP chicks at 90 days, whereas the weights of oviduct was significantly less. The adrenal, ovary and oviduct of HPO chicks was significantly greater at 90 days. The absolute and relative weights of liver and lymphoid organs (thymus, bursa and spleen) showed significant increment in HPO chicks as compared to LP control chicks, while the weights of spleen and bursa showed significant increment in HPR chicks. The serum corticosterone levels showed a progressive decrease from 30-90 days in all the three groups of chicks. The serum T_3 concentration decreased in LP control and increased in HPR and HPO chicks from 30-60

days with no significant difference recorded at 90 days. The T_4 concentration decreased in LP control chicks and increased in HPR and HPO chicks from 30-90 days. The changes in serum progesterone levels were non-significant, except for a significant decrement in HPR chicks at 60 days. The histometric data of the ovarian follicles reveals a low progression of follicular development followed by augmented development in the third month in HPO chicks than the control chicks. The HPR chicks showed higher percentage of big and large follicles than HPO, but lower than control. Overall, the present study tends to indicate differential effects of superimposed HPR or HPO over LP on the hypothalamo-hypophyseal axis on intraovarian functions.