SUMMARY

Chapter 1

The effects of changing photoperiod from LD 6:18 (Short Photoperiod;SP) to LD 12:12 (NLD) on first and second lay performance were studied in RIR breed of domestic fowl. Birds reared under SP from day 1 till 90 days and thereafter maintained under an ambient photoperiod of LD 12:12 (NLD) showed early initiation of egg laying (IL) by 58 days when compared to the birds reared continuously under NLD. The total number of eggs/bird/year were significantly more in birds reared under SP (193.68 V/s 168.47). However, the average weight of eggs was significantly lower when compared to NLD birds (44.68 gms V/s 46.59 gms). Birds of 72 weeks of age maintained under SP for 30 days, failed to lay any egg during the course of study. While, birds maintained under NLD exhibited poor second lay performance (96.47 eggs/hen/yr). Overall, the data confirms that, there is a favourable influence of SP in pullets but not in the adult hens.

Chapter 2

One day old pullets of Indian RIR breed were subjected to mild hyper. or hypocorticalism (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 cycle of egg laying. The results were compared with the egg laying performance of pullets reared under NLD throughout. Whereas, the HPR hens showed an early initiation of egg laying by 2 days and, a delay in termination by 4 days, the HPO hens showed a delay in initiation and an

early termination by 2 days. The NLD and HPR hens laid almost similar number of eggs (168 vs 171) whereas, the HPO hens laid significantly lesser number of eggs. Adult hens towards the end of their egg laying (72 weeks) subjected to the above experimental schedule for 30 days laid 15% more eggs under HPR condition and 22% less eggs under HPO condition than the NLD hens. These results provide suggestive evidences for influence of altered corticosterone levels in growing pullets and adult hens on egg laying performance.

Chapter 3

Egg laying performance of RIR breed of domestic fowl rendered hyper./hypocorticalic (HPR/HPO) and reared under short-photoperiod (SP; LD 6:18) from d1 till d90, and thereafter under normal photoperiod (NLD; LD 12:12) is assessed. Except for a slight delay in initiation of lay (by 9 days) in HPO hens, all the groups of hens initiated egg laying by 4 months.The average number of eggs/hen laid by HPR birds (197) and HPO birds (184), were marginally more in the former and significantly lesser in the latter, as compared to the controls (193). Feed consumption data/dozen eggs was marginally less in HPR birds and marginally high in HPO birds.

The present study suggests a favourable influence of HPR, and partially negative influence of HPO over the favourable influence of step-up photoperiod in terms of laying performance of Indian RIR breed of domestic fowl.

Chapter 4

The present study deals with the composition of eggs laid by RIR breed of domestic fowl , reared under a short-photoperiod (SP; LD 6:18), from d1

till d90 and thereafter shifted to normal light and dark schedule (NLD; LD 12:12), as against birds reared throughout under NLD. On an overall basis, all the physical parameters studied (egg weight, egg volume, shell thickness and yolk and albumen weight) were significantly lesser in SP eggs as compared to NLD. The overall content of protein in yolk and albumen of SP eggs was similar to that of NLD eggs. The glucid content decreased in yolk and increased in albumen of SP eggs. The lipid content in both, yolk as well as albumen was significantly increased in SP eggs. In terms of calorific value/100gms of edible egg, SP eggs recorded an increment by 14%as compared to that of NLD eggs. It is concluded that, exposure pullets to of short photoperiod during rearing period can induce subtle alterations in composition and energy content of eggs laid by these birds.

Chapter 5

The effect of subjecting RIR pullets to mild hyper or hypocorticalism during their growth phase (day1 to day 90) and reared under a constant photoperiod of LD 12:12 (NLD), is assessed in terms of physical features and biochemical composition of their eggs. The egg and albumen weights in HPR and HPO birds were less compared to those of NLD birds. The lipid content in yolk and the protein content in albumen of HPR and HPO eggs showed an increase. The cholesterol content showed an increase in the yolk of HPR eggs and, a decrease in albumen of both 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 stage has effects on composition of eggs by bringing about fine changes in metabolic features of liver and oviduct.

Chapter 6

Alteration in egg composition due to induced adrenocortical excess (HPR) or insufficiency (HPO) in pullets of RIR breed reared under a short-photoperiod (SP; LD 6:18), during the first trimester of post-hatched development has been studied. All the physical measurements of HPR eggs were similar to those of SP eggs. Except for the increment in egg weight and egg volume , no other physical parameter showed alteration in HPO eggs as compared to SP eggs. Both, HPR and HPO had differential effects on metabolite load in yolk and albumen, as evidenced from the recorded increase in protein content of yolk of HPR eggs and albumen in the HPO eggs respectively. The glucid content recorded decrement in yolk, and increment in albumen of HPR and HPO eggs respectively. Whereas, the lipid content in albumen significantly decreased in HPR eggs, the same recorded significant increment in yolk and albumen of HPO eggs. Except for the slight lower calorific value of HPO eggs, the calorific value in all the three groups remained similar. Overall, it is inferable that hyper. or hypocorticalism during rearing stage has additive or nullifying effect over SP in terms of metabolite load of the eggs.

Chapter 7

Effect of rearing pullets of RIR breed, under short - photoperiod (SP; LD 6:18) from d1 till d90 and, thereafter under normal photoperiod (NLD; LD 12:12), on histomorphology and adrenal, thyroid and ovarian hormone and, growth rate of adrenal, thyroid, ovary, oviduct, liver and lymphoid organ is carried out. The body weight and growth index of SP pullets were less as compared to NLD pullets. Except for the ovary, which recorded marginal increment, weights and growth indices of thyroid, adrenal and oviduct were

decreased under SP. The weights of liver and all the lymphoid organs ware higher at 30d, and were similar at 90 days in SP pullets as compared to NLD. The histometric data suggest that the transition from small to big follicles was slower in ovary of SP pullets and further, reduced degree of follicular atresia was also noted in SP pullets. Except for the higher corticosterone level at 30 days and higher progesterone level at 30 and 60 days, relative levels of all the hormones at all the ages were lower in SP pullets. In general, the present observations tend to suggest favourable intraovarian changes during the period of exposure of pullets to SP.

Chapter 8

Influence of mild hypercorticalism (HPR) or hypocorticalism (HPO) in RIR pullets reared under normal photoperiod (NLD; LD 12:12) during first 90 days of post-hatched development on, histomorphology and hormones of adrenal, thyroid and ovary and, growth rate of adrenal, thyroid, ovary, oviduct, liver and lymphoid organ has been carried out. There was no effect of HPR on body weight, while body weight of HPO chicks was lesser at 90 days as compared to controls. The absolute and relative weights of thyroid, adrenal, ovary and oviduct were higher in both HPR and HPO chicks throughout the period of study. The relative weight and growth indices of liver and lymphoid organs were higher in HPR pullets and, lower in HPO pullets at 90 days. The relative levels of corticosterone and T_3 were higher in HPR and lower in HPO chicks, while the levels of progesterone were lower in both HPR and HPO chicks, while that of T_4 remained similar in all the three groups. In the ovary the rate of transition from small to big follicles was slightly higher in HPR pullets, and the same was retarded in HPO pullets. In general it is concluded that, HPO during rearing stage of pullets has some negative influence and, HPR has some subtle favourable influence on ovarian functions.

Chapter 9

Influence mild hypercorticalism (HPR) or hypocorticalism (HPO) and short photoperiod (SP; LD 6 :18) in RIR pullets during first 90 days of post-hatched development on, histomorphology and hormone of adrenal, thyroid and ovary, and growth rate of adrenal, thyroid, ovary, oviduct, liver and lymphoid organ has been carried out. The body weight of both, HPR and HPO chicks was significantly greater than the control chicks at 90 days. The organ weights and growth rate of thyroid, adrenal, ovary and oviduct showed significant increment throughout the period of study in HPO chicks while, HPR chicks showed increased weight and growth rate only between 60 and 90 days. Favourable influence of HPR on growth of liver, and that of HPO, on growth of lymphoid organs, is marked by higher relative weight of liver in HPR chicks, and that of lymphoid organs in HPO chicks at 90 days. The relative level of corticosterone was similar in all the three groups of chicks. However, the serum hormone levels of T_3, T_4 and progesterone showed significant increment in HPR and HPO chicks. Rate of transition from small to big and big to large follicle was similar in the ovary of all the three groups of chicks. From the present study it can be concluded that there are subtle influences of HPR and HPO under SP on organ weights and serum hormone levels studied and that, these alterations may exert modulatory influence on SP induced intra-ovarian molecular mechanisms.

" We must not conceal ourselves the fact that the causal investigation of organism is one of the most difficult, if not the most difficult, problem which the human intellect has attempted to solve, and that this investigation, like every causal science, can never reach completeness, since every new cause ascertained only gives rise to fresh questions concerning the cause of this cause ".

Wilhelm Roux, 1894.