Response of the Circadian Rhythm of Body Weight and Testis in Male Grey Quail (Coturnix- coturnix)

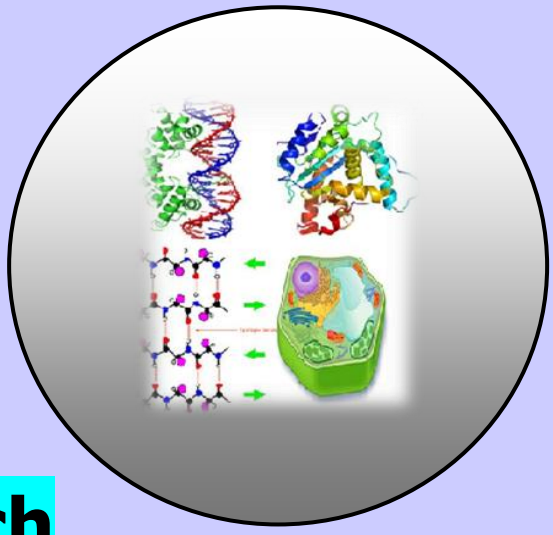
By

Kalpana Singh

ISSN 2319-3077 Online/Electronic
ISSN 0970-4973 Print

Index Copernicus International Value
IC Value of Journal 46.52 Poland, Europe (2015)
Journal Impact Factor: 4.275
Global Impact factor of Journal: 0.876
Scientific Journals Impact Factor: 3.285
InfoBase Impact Factor: 3.66

J. Biol. Chem. Research
Volume 34 (1) 2017 Pages No. 9-13



Journal of Biological and Chemical Research

An International Peer Reviewed / Referred Journal of Life Sciences and Chemistry

Indexed, Abstracted and Cited in various International and National Scientific Databases

Published by Society for Advancement of Sciences®

J. Biol. Chem. Research. Vol. 34, No. 1: 9-13, 2017
(An International Peer Reviewed / Refereed Journal of Life Sciences and Chemistry)
Ms 33/2/96/2016

ISSN 0970-4973 (Print)
ISSN 2319-3077 (Online/Electronic)

http:// www.sasjournals.com
http:// www.jbcr.co.in
jbiolchemres@gmail.com

RESEARCH PAPER

Received: 17/10/2016 **Revised: 09/02/2017** **Accepted: 11/02/2017**

Response of the Circadian Rhythm of Body Weight and Testis in Male Grey Quail (Coturnix- coturnix)

Kalpana Singh

Department of Zoology, R.S. Govt. Degree College Shivrajpur, Kanpur, U.P., India

ABSTRACT

An attempt was made to ascertain the validity of Bunning hypothesis that indicates the involvement of an endogenous circadian rhythm controlling the pre-migratory events (viz. body weight increase) in the Grey Quail in the north India.

The male Grey Quails (coturnix - coturnix) were subjected to different lighting regimes of twenty to thirty hours duration which three hour photo phase was coupled with different duration of scot phases. There was a response obtained during two regimes viz. 3L: 25D and 3L: 27D.

The data indicates that light regimes 3L: 27D were gonad stimulatory while in 3L: 25D photoperiodic regime is gonad inhibitory. Body weight with slight variation each month comes out to be maximum in 3L: 25D regime during the month of December. In the 3L: 27D regime an almost continuous rise and tall and aberration in body weight in alternate months was observed till it reached a maximum in January in one of the coldest month of the year. The results obtained conformed to those of Bunning in Germany.

Keywords:

INTRODUCTION

Day length and light has been recognized as a major source of temporal information in the control of migration and associated events in a number of migratory birds Farmer and Follett 1966, Lofts and Murton1968, Evans 1970, King 1970, Furner and Lewis 1971.Long days undoubtedly, induce significant increase in the body weight and fattening of birds. Tewary and

Prasad 1978, Saxena 1983, Saxena and Saxena 1984, Saxena et al. 1987, 1988 and the light is also proved to be an effective source to that effect in tropical and sub-tropical species Disney et al. 1961, Thapliyal and Tewary 1964, Epple et al. 1972, Tewary and Kumar 1982, Tsutsui et al.1992, Saxena et al. 1995. It has been rightly speculated that they share a common functional basis because of the physiological similarity and the apparent coincidence of seasonal gonad and metabolic activities, Since the premigratory events such as increase in body weight and fat deposition seem to be photo periodically controlled, the present investigations were under taken to explore, confirm and establish the involvement of the circadian rhythm in the photoperiodic control of body weight cycle in the Grey Quail.

The Grey Quail **(*coturnix-coturnix***) is a sexually dimorphic. The male bird having black anchor neck on the throat while in the case of the female usually spotted black.

MATERIAL AND METHODS

Adults male Grey Quails were purchased from the local dealer of Kanpur. Adults male Grey Quails which were caged in the light proof wooden boxes, each cage having 40W bulb and an automatic timer.

There was a supply of sufficient food and water ad-labium. Prior to their being used for experimentation. The male Grey Quails were acclimatized to the laboratory condition for fifteen day. They were in three groups each group having three birds only. The acclimatized male Grey Quail were then exposed to ultra-short day photo periodic cycles consisting of a 3h photo phase and scot phase of two lengths. These cycles were 3L::25D and 3L: 27D for a total period of nine months. Time switches connected with 40w bulbs controlled the Light/ Dark cycle in the cages. There was no tack of food and water yet it is resupplied during the main photo phase each day.

Prior to the beginning of the experiment, the weight of the bird was taken on a physical balance later they were weighed and size of the left testis measured monthly till the appointed time of the experiment. The control birds were kept in the laboratory and were given natural day length.

The data of the birds that died during the period of investigation were no used though statistically analyzed by Student's 'T' test.

OBSERVATION

BODY WEIGHT

3L: 25D –The body weight increased in the month of January ($P<0.01$) and decreased in April and May ($P<0.005$) when compared with the control birds. The body weight further increase in June ($P<0.01$) in the little decrease in July and August the difference was at ($P<0.01$) when the control birds.

3L: 27D:- –The body weight increased up till April which decreased a little in the month of May. The difference was not significant when compared with the control bird. The body weight decreased in June and July ($P<0.025$), and August ($P<0.01$).

CONTROL BIRD – The body weight of normal day light receiving birds increased in January and decreased up till April which further increased again in the month of May. The body weight decreased from June till August.

TESTIS SIZE

3L: 25D:-The testis size increased in the month of January (P<0.01), February (P<0.025), March (P<0.005). The testis size increased till May the difference was at (P<0.005) when compared with control birds the testis size decreased in June (P<0.005) with further increase in July (P<0.005). Testis size decreased again in August (P<0.01). The photoperiodic 3L: 25D is gonad inhibitory.

3L: 27D: -The testis size started to increase from December to February with decrease in the month of March. The difference was not significant when compared with control birds. The testis size further increased in April (P<0.005) decreased in May (P<0.005), increased from June to August (P<0.005). The photoperiodic 3L: 27D is gonad stimulatory.

CONTROL BIRD:-The Testis size of normal day light receiving birds decreased in January, increased in February, again decreased till April. The testis size started to increase from May to June who decreased in July and August.

DISCUSSION

The experiment with male Grey Quails using ultra-short photo phase of 3 hour in series of humeral cycles twenty to thirty hour having various combinations of scot phases in which the positive photoperiodic response is resulted in 3L: 25D and 3L: 27D.Our results seem to be suggestive of that the amount of light may not be factor in initiation of the pre migratory events viz. Body weight increase in male Grey Quail. 3L: 25D photoperiodic schedule is gonad inhibitory and 3L: 27D gonad stimulatory. It appears, therefore, that it may not be the amount of light or darkness that initiates the occurrence of pre migratory events in these birds. These results may well be rationalized taking into account the operation of an endogenous circadian rhythm Bunning 1936, Pittendrigh and Minis 1964. According to their assumption a photoperiodic response is the result of the coincidence of light with the photo inducible phase of an endogenous circadian rhythm. A question may arise here that how this ultra-short photoperiod of 3H in the present experimentation coincides with the photo inducible phase of the endogenous circadian rhythm. A possible explanation may be that the phase advance of the photosensitivity by these cycles brings coincidence of photo inducible phase in a provided duration, with the external photo phase, a suggestion put forward after study by Hemmer and Enright 1967, Farner 1975, Farner et al. 1977, Aschoff 1965, Bhatt 1992, Singh 1992, Misra 2012 have investigated that a positive response occurs when an advance in photo sensitivity of the response system brings coincidence (daily or otherwise) of photo inducible phase with the external photo phase and in other avian species of controls the increase in body weight.

Meier 1976, Farner 1976, of course Meier 1976 has suggested that there is an existence of an endogenous circadian rhythm of the photo regulatory function in the while throated sparrow and our results are in conformity with his view of existence of an endogenous circadian rhythm in controlling the body weight increase in the male Grey Quail.

ACKNOWLEDGEMENTS

Author isthankfull to Dr M.M Abid Ali Khan for his incouragement to write this article.

REFERENCES

Aschoff, J., (1965). The phase-angle difference in circadian periodicity. In: Circadian clocks (J.Aschoff, Ed) pp. 262-276. North-Holland, Publ.co. Amsterdam.

Bhatt (1992). The photoperiodic control of seasonal reproduction in Birds. Ph.D. Thesis Kanpur University, Kanpur. India.

Bunning, F. (1936). Die endogen Tagershythmikals Groundage der photoperiodischen Reaktion. *Bar. Deut. Bot. Ges.* 54: 590-607.

Disney, H.J.S. Lofts, B. and Marshall, A.J. (1961). An experimental study of the internal rhythm of reproduction in the red-billed ditch. Quelea-quelea by means of photo stimulation with a note onmelanism induced in capacitivity. *Proc. Zoo. Soc. Land.* 136: 123-129.

Epple, A.G., D.S. Farner and Lewis, R.A. (1972). The photoperiodic testicular response of tropical finch, Zonotrichia cape sis costaricensis, *Condor*, 74: 1-4.

Evans, P.R. (1970). Timing mechanisms and the physiology of bird migration. *Sci. Program*. 58: 263-275.

Farner, D.S. and Follett, B.K. (1966). Light and other environmental factors affecting avian reproduction. *J Anim. Sci. Suppl.* 26: p, 90-118.

Farner, D.S. (1975). Photoperiodic controls in the secretion of gonadotropins in birds. *Am. Zool*. 15 (supplement) 117-135.

Farner, D.S. (1976). Photoperiodic controls and reproductive cycles in zonotrichia. In: Pro XVII nt. Ornithology Conger. *Australian Acad. Sci Conberra*, pp.369-383.

Farner, D.S., Donham, N.N.N.N.R.S., Lewis, R.A., Mattock, P.W. Jr., Darden. T.R. and Smith, J.P. (1977). The circadian component in the photoperiodic mechanism of the House Sparrow, Passer domestics. *Physiol. Zool.,* 50: 247-268.

Farner D.S. and Lewis R.A. (1971). Photoperiodism and reproductive cycles of birds. *Photo physiology*, 6:325-370.

Hamner, W.M. and Enright, J.T. (1967). Relaationships between photoperiodic and circadian rhythm of activity in the House Finch. J. Exp. Bio.46:43-61.

King, J.R.1970-Photoregulation of food intake and fat metabolism in relation to avian sexual cycles. In: La photo regulation de la reproduction chemise oiseauxelles mammileres,1(Eds.) Paris: Int. C.N.R.S.

Lofts, B.and Murton, R.K.1968-Photoperidic and physiological adoptions regulating avian breeding cycles and their ecological significance. J.zool. Land. 155: 327-394.

Meier, A.H.1976-Chronoendocrinology of the white throated sparrow. In: Proc. XVI Internal.Ornithol. Congr. Australian Acad. Sci. Canberra. Pp.355-368.

Misra, A.K.2012-Significance of photoperiods on the body weight, Growth and Development of Testis in coturnix-coromandelica. Pg.68.(Abs.)Nat. Sci.for Shaping the Future of India .

Pittendrigh, C.S. and Minis, D.H.1964- The photoperiodic time measurement in Pectnophora gossypiella and its relation to the circadian system in that species. In: Biochromometry (M.Menaker, Ed) pp.212-250.Nat. Acad. Sci. Washington, D.C.

SAxena, V.L.1983-Light, food and Indian quails. Recent trends in life Sci. Eds. A Papal Kishna, S.B.Singh and A.K. Saxena 211-216 Manu Pub. Kanpur.

Saxena, V.Land Saxena, A.k.1984- Photoperiodic response of rain quail. Annals' Endo.(Paris)45:403-408.

Saxena, V.L.Bagum.H and Saxena, A.K.1987- Effect of different feed and light on body weight of rain quail coturnix- coromandelica. Trends in life Sci. India.2 (1):69-72.

Saxena, A.K.Saxena, V.L.and Begum, H.1988- Role of thyroid hormone and light on gonad and body weight of the rain quail cotunix-coromandelica..Trends in life Sci. India .30:41-46.

SaxenaV.L, Singh, K.SAxenaA.K.andSinghA.M.1995-Response of the circadian rhythm of body weight in grey quail 'coturnix-coturnix' Pave. Vol. 33.nos.1&2.

Singh, K.1992-Photoperiod regulating Avian Breeding cycle of quails.Ph.D. Thesis Kanpur Uni.Kanpur.India.

Tewary, P.D. and Prasad, B.N.1978- Photoperiodic response of redheaded buntings (embers bruises). Third all India symposium on comparative Endocrinology. Bhubaneswer, India. pp.72 (abs.).

Tewary, P.D and Kumar, V.1982- Photoperiodic response of subtropical migratory finch, the black headed bunting (Emblemize melanocephala). Condor. 84:168-171.

Thapllyal,J.P. and Tewary,P.D.1964- Effect of light on the pituitary, gonad and plumage pigmentation in the avadavat (Estella amanadava) and baya weaver (Placers Philippines) proc. Zool. Soc. London.142:67-71.

Tsutsui, K.S. Kawashima, S. Saxena, V.L. and Saxena, A.K.1992-Binding properties and photoperiodic influence of Follicle stimulating Hormone Receptors in the subtropical wild quail. Zoological sci. 9: 649-657.

Corresponding author: Dr. Kalpana Singh, Department of Zoology, R.S. Govt. Degree College Shivrajpur, Kanpur, U.P., India
Email: drkalpanasingh4@gmail.com