amount of activities appear to be structure-related within the broad class of aminoglycoside antibiotics.

As for the kind of activity, the following features of the potency curves could serve as a useful aid for identification: a) shape of the curve, b) steepness of the middle part of the curve, c) the appearance of the upper and/or lower parts of the curves, d) double inhibition zones at the acidic pH values which merge at around the neutral pH (hygromycin B and spectinomycin), e) inhibition zones only at certain pH values (kasugamycin). For the amount of activity the following parameters are to be considered: 1. absolute zone sizes at the various pH values and 2. eventual secondary zones.

The diffusibility and potency of the individual aminoglycoside antibiotics at different pH-values seem to allow for the use in a simple, rapid and relatively reproducible assay for the early screening and identification of most of the entities in this group of antibiotics. For example, we have been able to identify neomycin one of the most frequently occurring aminoglycoside antibiotics in the early phase of isolation by this method. The pH activity curve of neomycin and that of a number of unknown isolates later shown by additional biological and chemical tests to be neomycin were almost superimposable. It is expected that the case is similar with the majority of other aminoglycosides.

1 K.L. Rinehart, Jr, J. infect. Dis. *119*, 345 (1969).
2 K.E. Price and J.C. Godfrey, Adv. appl. Microbiol. *18*, 191 (1974).
3 J. Berdy, Adv. appl. Microbiol. *18*, 309 (1974).
4 S.L. Rosenthal, N.Y. State J. Med. 535 (1975).
5 S. Umezawa, in: Drug Action and Drug Resistance in Bacteria, vol.2, p.3. Ed. S. Mitsuhashi. University Park Press, Tokyo 1975.
6 K.L. Rinehart, Jr, and R.M. Stroshane, J. Antibiot. *29*, 319 (1976).
7 J. Uri, Nature (Lond.) *183*, 1188 (1959).
8 J.P. Hou and J.W. Poole, J. pharm. Sci. *60*, 503 (1971).
9 V. Betina, Nature (Lond.) *182*, 196 (1958); Chromatogr. Rev. *7*, 119 (1965).
10 T.C. McIlvaine, J. biol. Chem. *49*, 183 (1921).

Certain biochemical changes in the ovary of a migratory bird, *Calandrella acutirostris tibetana*

R.C. Sinha and S. Sinha[1]

Physiology Laboratory, Department of Zoology, Patna University, Patna-5 (India), 7 November 1978

Summary. The changes in the ovarian cholesterol, glycogen and ascorbic acid of Bagheri, *Calandrella acutirostris tibetana,* during its non-breeding and breeding periods were studied. There was a significant increase in all the 3 biochemical constituents during the breeding period.

The changes in the chemical composition of the different tissues during different seasons in tropical nonmigratory birds are well documented. There is, however, practically complete lack of information on the altered chemical composition of different tissues during different seasons of a tropical migratory bird. Therefore, it was considered of interest to study the changes in the level of cholesterol, glycogen and ascorbic acid in the ovary during non-breeding and breeding periods of a tropical migratory bird, Bagheri, *Calandrella acutirostris tibetana.*

Materials and methods. Bagheri, *Calandrella acutirostris tibetana* is a migratory, small-sized sparrow-like bird available in plenty in Patna 25.37 N 85.12 E and its adjoining areas from September to April; it then migrates to Ladakh 34.30 N 77.30 E for breeding from May to July (Ali and Dillon[2]). In order to study the complete cycle of reproduction, a good stock of birds was kept in large aviary cages in April and maintained till July for monthly sampling. The cages were kept in a well ventilated and lighted place and temperature was maintained at 14–16 °C. The birds in captivity showed migratory restlessness. The birds were fed ad libitum on a nutritionally adequate diet, and were weighed at regular intervals. Fresh water was always available. Rigorous efforts were made to assure that the birds were disturbed to a minimum extent.

The birds weighing 22–24 g were taken and ovary was dissected out and accurately weighed. The routine histological investigations for the complete ovarian and thyroidal cycles were made throughout the year. Ovarian cholesterol was estimated by Sackett's method as described by Varley[3]. The glycogen was estimated according to the method of Kemp and Andrienne[4]. The ascorbic acid concentration was determined according to the 2-4 dinitrophenyl-hydrazine method of Roe[5].

Results and discussion. The ovary was in a regressed state during the non-breeding period (August–mid April). A noticeable increase was evident in the last week of April and this weight change continued till July. Ovarian weight increased 42-fold from April to July, and this increase was exponential. The development of the ovarian follicle was intense but brief. Mature ova were observed but no post-ovulatory follicles were observed in the breeding period (May to July). However, it was interesting to note that in the male, sperm were present in the lumen of the tubule in June during the breeding period in captivity.

The concentration of cholesterol, glycogen and ascorbic acid in the ovary showed a significant increase during the breeding period (table). Since cholesterol is a precursor of steroid hormones, it was expected that cholesterol content of the ovary would increase due to the greater demand for cholesterol for the production of ovarian hormones like estrogen and progesterone. The synthesis of estrogen in a migratory bird is important since estrogen is concerned with the increase of migratory fat that accumulates in the s.c. and i.p. areas (Thayer et al.[6]). Thyroid hormone plays an important role in controlling the plasma cholesterol level. It has been established that thyroid hormone depresses plasma cholesterol as well as liver cholesterol level (Turner et al.[7]; Handler[8]). If so, plasma cholesterol level should be higher when the thyroid activity was less. The annual gonadal cycle in most of the finches studied in tropical birds was inversely related to thyroid activity cycle. Gonads were at peak-phase of activity when thyroid function was lowest and vice-versa (Thapliyal[9,10]). Besides, surgical ablation of the thyroid glands led to precocious development of the gonads (Thapliyal and Pandha[11]). In this bird, the thyroid activity is inversely related to the reproductive activity (Sinha[12]). Therefore, the rise in the

Ovarian cholesterol, glycogen and ascorbic acid concentration during non-breeding and breeding periods

Biochemical constituents	Non-breeding	Breeding	p < values
Cholesterol (mg/g wet wt)	3.25 ± 0.472	5.35 ± 0.465	0.01
Glycogen (mg/g wet wt)	41.08 ± 3.74	74.16 ± 4.40	0.005
Ascorbic acid (mg/100 g wet wt)	20.3 ± 1.75	24.8 ± 2.13	0.01

Values are mean ± SD, n = 10.

cholesterol level in the ovary may be due to less thyroid activity during the breeding period. Cholesterol accumulates under the stimulation of FSH, a hormone required for the development of ova (Lofts[13]). Therefore, it is possible to state that both ovarian development and ovarian cholesterol may be under pituitary control.

The thyroid hormone accelerates the rate of absorption of monosaccharides, and therefore glycogen store of different tissues diminishes as a consequence of glycogenolysis. Hypothyroidism, on the other hand, increases the glycogen content of the liver and muscle (Thapliyal et al.[14]). In the bird under investigation, the thyroid activity is at the lowest during the breeding period (May to July) and the thyroid activity is high during the non-breeding period which is from August to April (Sinha[12]). Therefore, the increase in ovarian glycogen may be due to less glycogenolysis as a consequence of reduced thyroid activity during breeding period.

It is generally accepted that ascorbic acid has a role in the conversion of cholesterol to corticosteroids (Sayers et al.[15]). The concurrent increase of ascorbic acid in the ovary may be due to the increased demand of ascorbic acid for the conversion of cholesterol to steroids and also for the production of mature ova.

The thyroids and ovary are both controlled by hormones of the anterior pituitary. It is possible that thyrotrophic and gonadotrophic functions of the pituitary are antagonistic. The pituitary is affected by temperature; low temperature in winter induces thyrotrophic activity and high temperature during summer induces gonadotrophic activity. In this bird, the high level of thyroxin in winter by itself could have a depressant effect on oogenetic activity.

1 Present address: Department of Biology, College of Science, University of Basrah, Basrah (Iraq).
2 S. Ali and S. Dillon, Handbk Birds India, Pakistan *5*, 24 (1972).
3 H. Varley, in: Practical Clinical Biochemistry, p. 309. Heinemann, London 1967.
4 A. Kemp and J.M.K.V.H. Andrienne, Biochem. J. *56*, 646 (1954).
5 J.H. Roe, Meth. biochem. Analysis *1*, 115 (1954).
6 R.H. Thayer, R.J. Jaap and R. Penquite, Poultry Sci. *24*, 483 (1945).
7 K.B. Turner, C.H. Present and E.H. Bidwell, J. exp. Med. *67*, 111 (1938).
8 P. Handler, J. biol. Chem. *173*, 295 (1948).
9 J.P. Thapliyal, Proc. 3rd Asia Oceania Congr. Endocr., Manila *36*, 283 (1967).
10 J.P. Thapliyal, Gen. Comp. Endocr. *2*, 111 (1969).
11 J.P. Thapliyal and S.K. Pandha, Endocrinology *81*, 915 (1967).
12 S. Sinha, unpublished data.
13 B. Lofts, Proc. 2nd int. Congr. Endocr. 100 (1964).
14 J.P. Thapliyal, R.K. Garg and G.S.R.C. Murty, Gen. Comp. Endocr. *21*, 547 (1973).
15 G. Sayers, M.A. Sayers, T.Y. Liang and C.N.H. Long, Endocrinology *37*, 1 (1945).

Changes in photoelectron transport of chloroplasts isolated from dark stressed leaves of maize seedlings[1]

N.K. Choudhury and U.C. Biswal

Laboratory of Biophysics and Biochemistry, School of Life Sciences, Sambalpur University, Burla 768017 (India), 1 November 1978

Summary. Transfer of light-grown maize seedlings to dark causes a loss in the contents of chlorophyll, protein and RNA of leaves, and a decline in DCPIP photoreduction by isolated chloroplasts. The loss in DCPIP-Hill reaction is attributed to the dark stress-induced damage of O_2 evolving system of thylakoid membranes.

Leaf senescence induced by dark stress causes a decline in the contents of total chlorophyll, protein and nucleic acids of the leaves[2-6]. The process brings about sequential loss and ultrastructural modifications of various cellular organelles[5]. Chloroplasts are shown to be the first organelle damaged by leaf aging[5]. The structural changes of chloroplasts induced by dark aging begin with a gradual decay of stroma lamellae followed by unstacking and destruction of grana thylakoids with concomitant appearance of osmiophilic globules[5]. These ultrastructural changes are accompanied by the changes in the various photochemical functions of plastid membranes[5,7,8]. Reports from various laboratories are available on the losses in the efficiency of photoelectron transport[3,7], photophosphorylation[8,9] and carbon dioxide fixation[9] of chloroplasts isolated from dark-induced senescing leaves. Leaf senescence has also been found to cause alteration in optical properties of chloroplasts[10]. However, these age-related changes of chloroplasts have mostly been studied during dark-induced senescence of leaves in detached condition. Literature on the photosynthetic changes during dark-induced senescence of attached leaves is meagre[11]. Secondly, little is known about the precise mechanism of loss in electron transport efficiency of plastid membranes, even though reports on aging induced loss in Hill reactions are well documented[3,7,11]. In the present investigation, an attempt is made to study the mechanism of loss in the efficiency of photosynthetic electron transport of chloroplasts isolated from attached senescing leaves of maize seedlings incubated in continuous dark. The data are compared with the previous results on dark-induced senescence of detached leaves.

Materials and methods. Maize seeds (*Zea mays* L. hybrid, Ganga 5) were germinated in petri dishes fitted with water-soaked cotton, and seedlings were kept in beakers with 10 ml of distilled water at 25 °C under continuous illumination (~ 2500 lx). A set of seedlings after 4 days of germina-